AXP640

Installation and Use

P/N: 6806800M24G

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Contact Address

Artesyn Embedded Technologies
Marketing Communications
2900 S. Diablo Way, Suite 190
Tempe, Arizona 85282

Artesyn Embedded Technologies
Lilienthalstr. 17-19
85579 Neubiberg/Munich
Germany

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About this Manual

Overview of Contents

This Installation and Use manual is organized as follows:

Chapter	Description
About this Manual	Lists all conventions and abbreviations used in this manual and outlines the revision history
Safety Notes	Describes the safety information which has to be regarded
Sicherheitshinweise	Translation of the chapter "Safety Notes" to German
Platform Architecture	Describes the system architecture
AXP640 Shelf Description	Provides an overview of the features of the system and lists the standard compliances
Site Preparation	Provides site planning considerations and checklists, describes the requirements and conditions
AXP640 Operations	Describes basic operating procedures
AXP640 Shelf Installation	Describes mounting and installation options
FRU Installation	Describes how to install and replace blades, modules, power components, fans, and air filter
Shelf Management Alarm Module	Describes the shelf management alarm module
Related Documentation	Lists related documentation and specifications

Abbreviations

This document uses the following abbreviations:

Abbreviation	Definition
10GBASE-BX4	The common name of the standard that defines 10 gigabit-per-second Ethernet data link over eight pairs of copper: Four pairs for transmit and four pairs for received.
AdvancedTCA	Advanced Telecom Computing Architecture
AMC	AdvancedTCA Mezzanine Card
ANSI	American National Standards Institute
ARP	Address Resolution Protocol

Abbreviation	Definition
ARTM	AdvancedTCA Rear Transition Module
ATCA	Advanced Telecommunications Computing Architecture
AWG	American Wire Gauge
BBS	Basic Blade Services
CGL	Carrier Grade Linux
CGM	Clock Generator Module
CISPR	Comité International Spécial des Perturbations Radioélectriques
CO	Central Office
CPU	Central Processing Unit
DC	Direct Current
DHCP	Dynamic Host Configuration Protocol
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMV	Elektromagnetische Vertraeglichkeit
EN	European Norm
ESD	Electrostatic Discharge
ETSI	European Telecommunication Standards Institute
FAE	Field Application Engineers
FCC	Federal Communications Comission
FCU	Firmware Upgrade Utility
FRU	Field Replaceable Unit
FUMI	Firmware Update Management Instrument
GmbH	Gesellschaft mit beschraenkter Haftung
HA	High Availability
HPI	Hardware Platform Interface
HS	Hot Swap
ID	Identifier
IEC	International Electric Code

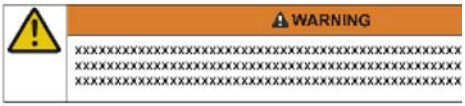
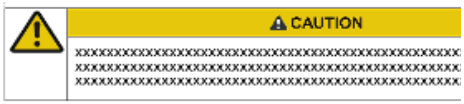
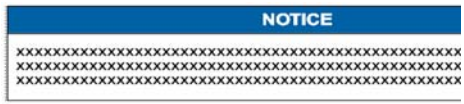
Abbreviation	Definition
IEEE	Institute of Electrical and Electronics Engineers
IPM	Intelligent Platform Management
IPMB	Intelligent Platform Management Bus
IPMC	Intelligent Platform Management Controller
IPMI	Intelligent Platform Management Interface
MMC	Mezzanine Management Controller
NAE	National Academy of Engineering
NEBS	Network Equipment Building System
NEC	National Electric Code
OEM	Original Equipment Manufacturer
OOB	Out-of-band
PCI	Peripheral Component Interconnect
PEM	Power Entry Module
PICMG	PCI Industrial Computer Manufacturers Group
PMC	PCI Mezzanine Card
RMCP	Remote Management Control Protocol
RoHS	Restriction of Certain Hazardous Substances
RTM	Rear Transition Module
SAF	Service Availability Forum
SCSI	Small Computer System Interface
SELV	Safety Extra Low Voltage
ShM	Shelf Manager
ShMC	Shelf Management Controller
SNMP	Simple Network Management Protocol
SSH	Secure Shell
SW	Ethernet Switch
TDM	Time-Division Multiplexing
TNV-2	Telecom Network Voltages without overvoltage

Abbreviation	Definition
TPE	Twisted-Pair Ethernet
UL	Underwriters Laboratories
VCCI	Voluntary Control Council for Interference
WEEE	Waste from Electrical and Electronic Equipment

Conventions

The following table describes the conventions used throughout this manual.

Notation	Description
0x00000000	Typical notation for hexadecimal numbers (digits are 0 through F), for example used for addresses and offsets
0b0000	Same for binary numbers (digits are 0 and 1)
bold	Used to emphasize a word
`Screen`	Used for on-screen output and code related elements or commands in body text
`Courier + Bold`	Used to characterize user input and to separate it from system output
Reference	Used for references and for table and figure descriptions
File > Exit	Notation for selecting a submenu
<text>	Notation for variables and keys
[text]	Notation for software buttons to click on the screen and parameter description
...	Repeated item for example node 1, node 2, ..., node 12
. . .	Omission of information from example/command that is not necessary at the time being
..	Ranges, for example: 0..4 means one of the integers 0,1,2,3, and 4 (used in registers)

Notation	Description
|	Logical OR
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury
	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury
	Indicates a property damage message
	No danger encountered. Pay attention to important information

Summary of Changes

Order No.	Date	Description
6806800M24A	November 2011	Preliminary version
6806800M24B	February 2012	Final Version Updated Figure "AXP640 Inter-connectivity" on page 47, *Shelf Ground Configuration* on page 55, and Table 3-5 . Added *AC Power Supply (PSU)* on page 105. Updated *DC Power Entry Module (PEM)* on page 106. Added *AC Power Cable* on page 119. Updated *Grounding the Shelf* on page 118, *PEM IPMC Firmware Upgrade* on page 129, *PEM Upgrade Sample Output* on page 130, and *Installation Procedure* on page 156.
6806800M24C	March 2012	Updated *Dimensions and Weight of System and Components*, *AXP640 Shelf Physical Characteristics* and *Ethernet Signals* on page 178. Added a Notice in *Standard Compliances* on page 72 *System Installation* on page 21 and *Systeminstallation* on page 33. Added sections *Laser* on page 29 and *Laser* on page 42. Updated sections *EMC* on page 20 and *EMV* on page 32.
6806800M24D	October 2012	Added *Ordering Information* on page 48, Figure "EEPROMS in Backplane" on page 60. Updated *Accessing the System* on page 125, *Installing the Shelf* on page 116, *Unused Slots* on page 153 , *Replacing the Fan Filter* on page 162, *SAM Diagram and Face Plate Layout* on page 168, *Power Requirements* on page 85, and *Shelf FRU SEEPROM* on page 171.
6806800M24E	December 2012	Updated *Standard Compliances* on page 72.
6806800M24F	May 2014	Re-branded to Artesyn. Updated Figure "Declaration of Conformity - DC" on page 75, Figure "Declaration of Conformity - AC" on page 74, Figure "DC Rating Label" on page 77 and Figure "AC Rating Label" on page 78. Update d the section *Ethernet Signals* on page 178 and Figure "Interhub Slot and Shelf Manager Connectivity" on page 179. Added new sections *Configuring Front Panel Network Interface* on page 180 and *Configuring RMCP Network Interface* on page 181.
6806800M24G	April 2015	Updated *Related Documentation on page 187.*

Safety Notes

This section provides warnings that precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed during all phases of operation, service, and repair of this equipment. You should also employ all other safety precautions necessary for the operation of the equipment in your operating environment. Failure to comply with these precautions or with specific warnings elsewhere in this manual could result in personal injury or damage to the equipment.

Artesyn intends to provide all necessary information to install and handle the product in this manual. Because of the complexity of this product and its various uses, we do not guarantee that the given information is complete. If you need additional information, ask your Artesyn representative.

The product has been designed to meet the standard industrial safety requirements. It must only be used in its specific area of office telecommunication industry, industrial control, and development. It must not be used in safety critical components, life supporting devices or on aircraft.

Only personnel trained by Artesyn or persons qualified in electronics or electrical engineering are authorized to install, remove or maintain the product. The information given in this manual is meant to complete the knowledge of a specialist and must not be used as replacement for qualified personnel.

Keep away from live circuits inside the equipment. Operating personnel must not remove equipment covers. Only factory authorized service personnel or other qualified service personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment.

Do not install substitute parts or perform any unauthorized modification of the equipment or the warranty may be voided. Contact your local Artesyn representative for service and repair to make sure that all safety features are maintained.

General

Danger of Injuries
At the system's rear there are sharp pins which can cause injuries.
Be careful when handling the system.

EMC

The product has been tested and found to comply with the limits for a Class A digital device in this system, pursuant to part 15 of the FCC Rules, EN 55022 Class A respectively. These limits are designed to provide reasonable protection against harmful interference when the product is operated in a commercial, business or industrial environment.

The product generates and uses radio frequency energy and, if not installed properly and used in accordance with this user's documentation, may cause harmful interference to radio communications. Operating the product in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

To ensure EMC protection use only shielded cables when connecting peripherals to assure that appropriate radio frequency emissions compliance is maintained. Installed blades must have the face plates installed and all vacant slots in the shelf must be covered.

An AXP640 that is shipped as a spare, replacement chassis, or an unconfigured system will not have filler panels installed. It is the responsibility of the customer to ensure that all open slots are filled with payload blades, rear transition modules (RTMs), or approved filler panels in order to be compliant with the safety/EMC regulatory markings.

Grounding
To ensure the system is properly grounded, each of the system's parts must contact the EMI gasket. The system contains gaskets at the shelf and module level.
The shelf is also fitted with ESD contacts. Please take care for proper ESD protection of the operator.

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Interference (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

The equipment is suitable for installation in a Common Bonding Network (CBN) or Isolated Bonding Network (IBN).

System Installation

System Damage
To avoid system damage verify that the system environment meets the environmental and power requirements given in this manual before installing the system.
Before you begin to set up and cable your new system, consider these guidelines:

- Restricted access area: Install the system only in a restricted access area.
- Installation codes: This unit must be installed in accordance with the National Electrical Code, Articles 110.16, 110.17, and 110.18 and the Canadian Electrical Code, Section 12.a
- Overcurrent protection: A readily accessible listed branch circuit overcurrent protective device must be incorporated into the building wiring. For appropriate AWG rating of the overcurrent protection device see NEC Table 310.16 and other national regulations.
- The protective bonding conductor depends on your power distribution topology. Make sure that you use an appropriate protective bonding conductor regarding the rating of the branch circuit protection.
- Install the system safely. Make sure that cables and cords are out of the way.
- Make sure that the set-up is comfortable for users.

System Damage
WARNING: The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

System Damage
Environmental contamination can impair system operation.
Locate the system in a stable area free of excess movement and jarring and free of dust, smoke, and electrostatic discharge (ESD). Make sure that the temperature does not exceed the operating temperature given in the environmental requirements in this manual and allow room for proper air flow for cooling.

Personal Injury or System Damage
The system is supplied by a TNV2 voltage. This voltage is considered hazardous.
Make sure that the power supply meets the local safety standards.

System Overheating
Inproper cooling leads to blade damage.
To ensure proper cooling always operate the system in a horizontal position. Furthermore, keep clear at least 6 cm adjacent to the cooling vents on the chassis front and back side. For detailed information refer to *Site Planning Considerations* on page 79.

Personal or System Damage
Unstable system installation in a rack can cause the rack to topple over.
Therefore, if your system is the only one in the rack, make sure to mount the system in the lowest part of the rack. If other systems are installed in one rack, start with the heaviest component at the bottom.
If the rack is equipped with stabilizing devices, make sure that they are installed and extended so that the rack is secure. Then proceed to mount or service the system.

Personal Injury or System Damage
When pulling the system out of the rack, it can fall down and cause injuries.
Pull out the system cautiously.

Personal Injury or System Damage
The system is heavy and if you carry it on your own you can hurt your back.
To prevent injury, keep your back straight and have two people lift the system or use additional lifting equipment.

System Damage
During the course of handling, shipping, and assembly, pins, shrouds and mounting screws, fans and other items can become loose or damaged.
Do not operate a damaged shelf, this can cause damage to devices that interface with it.

Electrical Hazard
The caution label on the system's rear near the grounding studs shows that you have to create an earth connection because there may be a high leakage current which is considered as hazardous.

High leakage current can cause injuries. Therefore, it is essential that you create an earth connection before connecting the PEM to a telecommuncation network.

System Damage
Wrong jumper settings can make the shelf in-operable. Therefore, never change the settings of the jumpers.

Blade and RTM Installation

Damage of Circuits
Electrostatic discharge and incorrect RTM or blade installation and removal can damage circuits or shorten their life.
Before touching the RTM, blade or electronic components, make sure that you are working in an ESD-safe environment.

Installation Sequence of RTMs and AdvancedTCA Blades
If you are going to install an RTM and an AdvancedTCA blade you have to regard the following sequence:
First install the RTM, then install the matching AdvancedTCA blade. Otherwise the blades and RTMs will be damaged.

Blade or System Damage
Installing a blade in the wrong slot causes blade or system damage.
Only install blades in the designated slots.

Damage of RTM and Front Blade
Removing the RTM from the system while the playload of the front blade is powered up may damage the front blade and RTM.
Whenever removing the RTM from the system, you have to power down the playload of the front blade first.

RTM Malfunctioning
Incorrect RTM installation and removal can result in RTM malfunctioning.
When plugging the RTM in or removing it, do not press on the face plate but use the handles.

RTM Damage
Installing the RTM with other blades than the ones designed for it may damage the RTM and the front blade.
Only install the RTM with the correct front blade.

Data Loss
Removing the RTM with the system power on and the blue LED on the front blade still flashing causes data loss.
Before removing the RTM from a powered system, power down the slot by opening the lower handle of the front blade and wait until the blue LED is permanently ON.

Blade Malfunctioning
Incorrect blade installation and removal can result in blade malfunctioning.
Make sure that the blade is connected to the system backplane through all assembled connectors and that power is available on all zone 1 power pins.

Operation

System Overheating
Cooling vents
Inproper cooling can lead to blade and system damage.

To ensure proper cooling and undisturbed airflow through the system always operate the system in a horizontal position and keep clear at least 60 mm at the back of the system. Do not obstruct the ventilation openings at the top and back of the system. Keep the fresh air intake at the bottom front side of the chassis completely clear, and ensure that fresh air supply is not mixed with hot exhaust from other devices.
To ensure proper air flow within the system make sure that all slots are populated with either filler blades, blades or dummy blades.

Product Damage
High humidity and condensation on blade surfaces causes short circuits.
Do not operate the system outside the specified environmental limits. Make sure the system is completely dry and there is no moisture on any surface before applying power. Do not start the system below 0ºC.

Injury
Caution: this unit has four -48V to -60V DC feeds. All must be disconnected to de-energize the system. To reduce the risk of injury, disconnect the feeds when removing power from the system.

System Damage
Air Filter
Air contamination can pollute the air filter and obstruct the air intake of the system which may cause system overheating and component damage.
To guarantee proper airflow through the system, the air filter has to be replaced at least every six months. Artesyn Embedded Technologies recommends to replace the air filter every 90 days. Filter replacement frequency depends on the environment the system is subjected to. Because central offices vary in physical location and cleanliness, check your air filters every week after you first install your system. In a dusty environment, a filter may need cleaning more often than a filter in a cleaner environment. Check the filters frequently until you have a good idea of how often it needs cleaning. Based on your findings, establish a regular cleaning schedule and keep a log to record the date of each filter cleaning or replacement.

This equipment is designed to permit the connection of the earthed conductor of the DC supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions must be met:

- This equipment shall be connected directly to the DC supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the DC supply system earthing electrode conductor is connected.
- This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor, and also the point of earthing of the DC system. The DC system shall not be earthed elsewhere.
- The DC supply source shall be located within the same premises as this equipment.
- Switching or disconnecting devices shall not be in the earthed circuit conductor between the DC source and the point of connection of the earthing electrode conductor.

French translation: Cet appareil est conçu pour permettre le raccordement du conducteur relié à la terre du circuit d'alimentation c.c. au conducteur de terre de l'appareil. Pour ce raccordement, toutes les conditions suivantes doivent être respectées:

- Ce matériel doit être raccordé directement au conducteur de la prise de terre du circuit d'alimentation c.c. ou à une tresse de mise à la masse reliée à une barre omnibus de terre laquelle est raccordée à l'électrode de terre du circuit d'alimentation c.c.
- Les appareils dont les conducteurs de terre respectifs sont raccordés au conducteur de terre du même circuit d'alimentation c.c. doivent être installés à proximité les uns des autres (p.ex., dans des armoires adjacentes) et à proximité de la prise de terre du circuit d'alimentation c.c. Le circuit d'alimentation c.c. ne doit comporter aucune autre prise de terre.
- La source d'alimentation du circuit c.c. doit être située dans la même pièce que le matériel. - Il ne doit y avoir aucun dispositif de commutation ou de sectionnement entre le point de raccordement au conducteur de la source d'alimentation c.c. et le point de raccordement à la prise de terre.

System Overheating
If you reduce the fan speed, the system temperature will rise.
Constantly control the system temperature once you have reduced the fan speed.
While operating the system ensure that the environmental and power requirements are met.

Injuries or Short Circuits
Blade or Power Supply
In case the ORing diodes of the blade fail, the blade may trigger a short circuit between input line A and input line B so that line A remains powered even if it is disconnected from the power supply circuit (and vice versa).
To avoid damage or injuries, always check that there is no more voltage on the line that has been disconnected before continuing your work.

Expansion

System Overload
To avoid an overload of the system check the total power consumption of all components installed (see the technical specification of the respective components). Ensure that any individual output current of any source stays within its acceptable limits (see the technical specification of the respective source).

Loss of Safety Compliance
Using of Additional Plug-in Blades
By using additional plug-in blades it may be possible that the system may be no more compliant to safety and EMC regulations.
The system integrator has to ensure that the compliancy is guaranteed.

Exchanging PEMs

Personal Injury through Electric Shock and Burning
Touching the PEM power input terminals with metallic objects on your hands, wrists, or hanging from your neck may lead to serious injuries like burns or amputations. Do not wear any metallic attire or commodity on your hands, wrists, or hanging from your neck when working at the power input terminals or power input cables. Be extremely careful when you use electrically conductive tools near the PEMs.

Short Circuits or Personal Injury
Ensure that the power feeds you plan to remove or attach are powered off and cannot be switched on while you are working.

Short Circuit and Electric Shock
To avoid short circuits and electric shock, the power lugs must not be energized before removing the screws. It is essential to ensure that the power lugs are not energized before loosening the screws. Be careful with the used tools in order to prevent a short circuit.

PEM Damage
Applying reversal power causes damage to the electrolytic capacitors of the filter. Therefore, only switch on the breakers if no red light is visible.

Exchanging Fans

Personal Injury
Rotating Fans
Inserting tools or fingers into operational fans may cause injuries.
Fans become exposed when the fan tray is pulled. Keep clear of the fans as long as they are rotating.
When the fan is removed, extreme care should be taken while handling the fan itself. The centrifugal forces will make the unit difficult to handle.

Cabling

Personal Injury
The cabling should follow existing cable paths using existing or similar cable fastenings. Never change the system's cabling as delivered by Artesyn. Check proper function of the system after cabling extensions. To avoid injuries always ensure that cables are securely installed so that nobody can trip over them.

Personal Injury through Electric Shock
Touching contacts and cables during system operation can cause injuries through electric shock.
To avoid electric shock make sure that contacts and cables of the system cannot be touched while the system is operating. If in doubt concerning cabling, ask your local Artesyn representative.

Cable Damage
Folding the fiber cable damages the cable and inhibits the data transmission. Therefore, make sure you do not fold the cable.

RJ-45 Connector

System Damage
RJ-45 connectors on blades are either twisted-pair Ethernet (TPE) or E1/T1/J1 network interfaces. Connecting an E1/T1/J1 line to an Ethernet connector may damage your system.

- Make sure that TPE connectors near your working area are clearly marked as network connectors.
- Verify that the length of an electric cable connected to a TPE bushing does not exceed 100 m.
- Make sure the TPE bushing of the system is connected only to safety extra low voltage circuits (SELV circuits).
- If in doubt, ask your system administrator.

Laser

Personal Injury
If a label with the words CLASS 1 LASER PRODUCT is affixed to the back of your system, the unit is equipped with a laser device. These devices contain a laser diode that produces invisible laser radiation harmful to the eyes.
Performing adjustments or procedures other than those specified in this manual may result in hazardous radiation exposure. Do not look into the optical lens at any time.

Battery

Blade Damage
Wrong battery installation may result in hazardous explosion and blade damage.

Always use the same type of battery as is installed and make sure the battery is installed as described in the user manual of the blade.
Always dispose of old batteries according to your country's legislation.

Environment

Environmental
Always dispose of used blades, system components and RTMs according to your country’s legislation and manufacturer’s instructions.

Sicherheitshinweise

Dieses Kapitel enthält Hinweise, die potentiell gefährlichen Prozeduren innerhalb dieses Handbuchs vorrangestellt sind. Beachten Sie unbedingt in allen Phasen des Betriebs, der Wartung und der Reparatur des Systems die Anweisungen, die diesen Hinweisen enthalten sind. Sie sollten außerdem alle anderen Vorsichtsmaßnahmen treffen, die für den Betrieb des Systems innerhalb Ihrer Betriebsumgebung notwendig sind. Wenn Sie diese Vorsichtsmaßnahmen oder Sicherheitshinweise, die an anderer Stelle diese Handbuchs enthalten sind, nicht beachten, kann das Verletzungen oder Schäden am System zur Folge haben.

Artesyn Embedded Technologies ist darauf bedacht, alle notwendigen Informationen zum Einbau und zum Umgang mit dem System in diesem Handbuch bereit zu stellen. Da es sich jedoch bei dem System um ein komplexes Produkt mit vielfältigen Einsatzmöglichkeiten handelt, können wir die Vollständigkeit der im Handbuch enthaltenen Informationen nicht garantieren. Falls Sie weitere Informationen benötigen sollten, wenden Sie sich bitte an die für Sie zuständige Geschäftsstelle von Artesyn Embedded Technologies.

Das System erfüllt die für die Industrie geforderten Sicherheitsvorschriften und darf ausschließlich für Anwendungen in der Telekommunikationsindustrie, im Zusammenhang mit Industriesteuerungen und in der Entwicklung verwendet werden. Es darf nicht in sicherheitskritischen Anwendungen, lebenserhaltenden Geräten oder in Flugzeugen verwendet werden.

Einbau, Wartung und Betrieb dürfen nur von durch Artesyn Embedded Technologies ausgebildetem oder im Bereich Elektronik oder Elektrotechnik qualifiziertem Personal durchgeführt werden. Die in diesem Handbuch enthaltenen Informationen dienen ausschließlich dazu, das Wissen von Fachpersonal zu ergänzen, können dieses jedoch nicht ersetzen.

Halten Sie sich von stromführenden Leitungen innerhalb des Systems fern. Entfernen Sie auf keinen Fall die Systemabdeckung. Nur werksseitig zugelassenes Wartungspersonal oder anderweitig qualifiziertes Wartungspersonal darf die Systemabdeckung entfernen, um Systemkomponenten zu ersetzen oder andere Anpassungen vorzunehmen.

Installieren Sie keine Ersatzteile oder führen Sie keine unerlaubten Veränderungen am System durch, sonst verfällt die Garantie. Wenden Sie sich für Wartung oder Reparatur bitte an die für Sie zuständige Geschäftsstelle von Artesyn Embedded Technologies. So stellen Sie sicher, dass alle sicherheitsrelevanten Aspekte beachtet werden.

Allgemein

Verletzungsgefahr
An der Rückseite des Systems befinden sich spitze Stifte, an denen Sie sich verletzen können. Seien Sie vorsichtig im Umgang mit dem System.

EMV

Das Produkt wurde getestet und erfüllt die für digitale Geräte der Klasse A gültigen Grenzwerte gemäß den FCC-Richtlinien Abschnitt 15 bzw. EN 55022 Klasse A. Diese Grenzwerte sollen einen angemessenen Schutz vor Störstrahlung beim Betrieb des Produkts in Geschäfts-, Gewerbe- sowie Industriebereichen gewährleisten.

Das Produkt arbeitet im Hochfrequenzbereich und erzeugt Störstrahlung. Bei unsachgemäßem Einbau und anderem als in diesem Handbuch beschriebenen Betrieb können Störungen im Hochfrequenzbereich auftreten.

Benutzen Sie zum Anschließen von Peripheriegeräten ausschließlich abgeschirmte Kabel. So stellen Sie sicher, dass ausreichend Schutz vor Störstrahlung vorhanden ist. Die Blades müssen mit der Frontblende installiert und alle freien Steckplätze müssen mit Blindblenden abgedeckt sein.

Ein AXP640, das als Ersatzteil, Austauschchassis oder unkonfiguriertes System ausgeliefert wird, enthält keine Platzhalter-Boards. Es liegt in der Kundenverantwortung sicherzustellen, dass alle leeren Steckplätze mit Boards, RTMs oder zugelassenen Platzhalter-Boards belegt sind, um die Sicherheits- und EMC-Vorschriften zu erfüllen.

Erdung
Um eine korrekte Erdung des Systems zu gewährleisten, befinden sich sowohl am System als auch an den einzelnen Modulen Dichtungen. Stellen Sie sicher, dass alle Systemteile die EMI Dichtung berühren.
Am System befinden sich auch ESD Kontakte. Stellen Sie sicher, dass jede Person, die mit dem System arbeitet, mit ESD-Schutz, zum Beispiel ESD Bändern, ausgerüstet ist.

Das Produkt ist eine Einrichtung der Klasse A gemäß dem Standard des Voluntary Control Council for Interference von Information Technology Interference (VCCI). Wird das Produkt in Wohngegenden betrieben, können Störungen im Hochfrequenzbereich auftreten. In einem solchen Fall ist der Benutzer verpflichtet, entsprechende Gegenmaßnahmen zu ergreifen.

Das Produkt ist für den Einsatz in Netzwerken mit gemeinsamem Potentialausgleich oder mit isoliertem Potentialausgleich geeignet.

Systeminstallation

Beschädigung des Systems
Bevor Sie das System installieren, überprüfen Sie, ob die im Handbuch beschriebenen Anforderungen erfüllt werden.
Beachten Sie folgende allgemeinen Sicherheitshinweise vor der Installation und Verkabelung des Systems:

- Bereich mit eingeschränktem Zugang - Installieren Sie das System nur in Bereichen mit eingeschränktem Zugang.
- Installationsrichtlinien: Dieses System muss gemäß folgender Richtlinien installiert werden: National Electrical Code, Artikel 110.16, 110.17 und 110.18 und Canadian Electrical Code, Abschnitt 12.a
- Überstrom Schutzeinrichtung - Eine leicht zugängliche Trennvorrichtung muss in der Gebäudeverkabelung eingebaut sein. Einen angemessenen AWG (American Wire Gauge - amerikanische Norm für Drahtquerschnitte) Wert der Überstrom Schutzeinrichtung können Sie der NEC (National Electrical Code) Tabelle 310.16 oder anderen nationalen Regelwerken entnehmen.
- Der Erdungsleiter ist abhängig von der Spannungsverteilungstopologie innerhalb Ihrer Anlage. Stellen Sie sicher, dass Sie einen angemessenen Erdungsleiter gemäß der Auslegung des Zugangsleitungsschutzes verwenden.
- Bauen Sie das System sicher ein. Stellen Sie sicher, dass Kabel und Leitungen nicht im Weg sind.
- Stellen Sie sicher, dass der Systemaufbau anwenderfreundlich ist.

Beschädigung des Systems
Die Gebäude-internen Schnittstellen ("intra-building ports" per GR-1089-CORE) der Geräte oder Baugruppen sind nur für gebäudeinterne Verkabelung vorgesehen. Die Schnittstellen sind als Typ 2 oder Typ 4 definiert (wie in GR-1089-Core beschrieben) und erfordern eine Isolation zu Leitungen außerhalb des Gebäudes.
Die Gebäude-internen Schnittstellen dürfen keine elektrisch leitende Verbindung zu Leitungen außerhalb des Gebäudes haben. Ein "Primary Protector" (wie in GR-1089-CORE beschrieben) ist keine ausreichende Absicherung, um die Gebäude-internen Schnittstellen mit Leitungen außerhalb des Gebäudes zu verbinden.

Beschädigung des Systems
Verschmutzungen können das System beschädigen.
Betreiben Sie das System an einem erschütterungsfreien Ort, an dem weder Staub, Rauch noch elektrostatische Entladungen auftreten. Stellen Sie außerdem sicher, dass die klimatischen Bedingungen, die in diesem Handbuch spezifiziert sind, eingehalten werden und genug Raum für die Luftzirkulation vorhanden ist.

Verletzungsgefahr und Beschädigung des Systems
Das System ist an eine TNV-2 Spannungsquelle angeschlossen. Diese Spannung kann gefährlich sein.
Stellen Sie sicher, dass die externe Spannungsversorgung den entsprechenden Sicherheitsstandards entspricht.

System Überhitzung
Unzureichende Kühlung kann zu einer Beschädigung der Boards führen.
Um eine ausreichende Kühlung sicherzustellen betreiben Sie das System nur aufrecht. Sorgen Sie außerdem dafür, dass ein aureichender Mindestabstand (mindestens 6 cm) vor den Lüftungsschlitzen an der Vorder- und Rückseite des Systems freigehalten wird. Genaue Informationen finden Sie im Kapitel *Site Planning Considerations* on page 79.

Verletzungsgefahr und Beschädigung des Systems
Wenn die Gewichte im Schaltschrank ungleich verteilt sind, kann der Schaltschrank umkippen. Bauen Sie das System deshalb ganz unten im Schrank ein, wenn es das einzige System im Schrank ist. Wenn mehrere Systeme in einen Schrank eingebaut werden sollen, plazieren Sie das schwerste System ganz unten und die leichteren weiter oben. Falls der Schaltschrank mit Kippsicherungen ausgestattet ist, stellen Sie sicher, dass diese auch installiert und ausgefahren sind, um einen sicheren Stand des Schranks zu gewährleisten. Beginnen Sie erst danach mit dem Einbau oder der Wartung des Systems.

Verletzungsgefahr oder Beschädigung des Systems
Das System kann beim Herausziehen herunterfallen und Verletzungen verursachen. Ziehen Sie das System vorsichtig heraus, damit es nicht herunterfällt.

Verletzungsgefahr oder Beschädigung des Systems
Das System ist schwer, und wenn Sie es alleine tragen, kann dies zu Rückenschäden führen. Heben Sie deshalb das System nur zu zweit und halten Sie beim Heben Ihren Rücken gerade oder benutzen Sie zusätzliche Hilfsmittel.

Beschädigung des Systems
Während des Transportes und Zusammenbaus des Systems können sich Teile, wie zum Beispiel Schrauben, Blenden, Stecker oder Lüfter lösen oder beschädigt werden. Nehmen Sie das System nicht in Betrieb, wenn Teile beschädigt sind. Dies könnte zu Beschädigungen an anderen Teilen führen.

Hoher Ableitstrom
Dieser Aufkleber befindet sich in der Nähe der Schuzleiter auf der Rückseite des Systems und warnt, dass Sie vor der Inbetriebnahme eine Erdung durchführen müssen, da hier ein hoher Ableitstrom vorhanden sein kann.

Hoher Ableitstrom kann zu Verletzungen führen.
Stellen Sie deshalb vor Anschluss des Systems an ein Telekommunikationsnetz unbedingt eine Erdungsverbindung her.

Beschädigung des Systems
Falsche Jumper-Einstellungen können dazu führen, dass das System nicht mehr funktioniert.
Ändern Sie deshalb nie die Einstellungen der Jumper.

Board und RTM Installation

Beschädigung des Boards
Berühren Sie das Board oder elektrische Komponenten in einem nicht ESD-geschützten Bereich, kann dies zu einer Beschädigung des Boards führen.
Bevor Sie Boards oder elektronische Komponenten berühren, vergewissern Sie sich, dass Sie in einem ESD-geschützten Bereich arbeiten.

Reihenfolge bei der Installation von RTMs und AdvancedTCA Boards
Die folgende Reihenfolge muß bei der Installation von RTMs und AdvancedTCA Boards eingehalten werden:
Installieren Sie zuerst das RTM und erst danach das passende AdvancedTCA Board. Ansonsten können RTM oder Board beschädigt werden.

Beschädigung des Boards oder Systems
Wird ein Board in den falschen Steckplatz im System gesteckt, können sowohl das Board als auch das System beschädigt werden. Installieren Sie Boards deshalb ausschließlich in dafür vorgesehene Steckplätze.

Beschädigung des RTMs oder Boards
Wird das RTM ausgebaut, während die Payload des dazugehörigen AdvancedTCA Boards noch nicht heruntergefahren ist, kann dies zu Beschädigungen am Board oder RTM führen.
Fahren Sie deshalb die Payload des AdvancedTCA Blades immer herunter, bevor Sie das dazugehörige RTM aus dem System entfernen.

Beschädigung des RTMs

Fehlerhafte Installation kann zu einer Beschädigung des RTMs führen. Verwenden Sie die Handles, um das RTM zu installieren/deinstallieren. Auf diese Weise vermeiden Sie, dass die Frontblende oder die Platine deformiert oder zerstört werden.

Beschädigung des RTMs oder Boards
Das System wird beschädigt, wenn die RTMs nicht zu den von vorne in dem System installierten Boards passen.
Stellen Sie deshalb sicher, dass Boards und RTMs, die von vorne bzw. von hinten in den gleichen Steckplatz des Systems eingebaut werden, stets zueinander passen.

Datenverlust
Das Entfernen eines RTMs während des Systembetriebs und blinkender blauer LED des Front Boards führt zu Datenverlust.
Vor dem Entfernen des RTMs im laufenden Systembetrieb, schalten Sie das entsprechende Board ab, indem Sie die Griffe des Boards öffnen. Warten Sie, bis die blaue LED dauerhaft leuchtet.

Fehlfunktion
Unsachgemäßer Ein- und Ausbau von Boards kann zu einer Fehlfunktion des Boards führen.
Vergewissern Sie sich, dass das Board über alle Stecker an die AdvancedTCA-Backplane angeschlossen und die Stromversorgung gewährleistet ist.

Betrieb

Überhitzung des Systems
Lüftungsschlitze
Unzureichende Lüftung kann Schäden an Boards und am System verursachen.

Um eine ausreichende Lüftung zu gewährleisten, stellen Sie sicher, dass das System während des Betriebs stets waagerecht steht und dass ein Freiraum von mindestens 60 mm an der Rückseite des Systems vorhanden ist. Halten Sie die Lüftungsschlitze an der Oberseite und der Rückseite des Systems frei. Halten Sie die Frischluftzufuhröffnung an der unteren Vorderseite des Systems völlig frei und stellen Sie sicher, dass sich die Frischluft nicht mit der Abluft von anderen Systemen mischt.
Um eine ungestörte Luftzirkulation zu gewährleisten, stellen Sie sicher, dass alle Steckplätze mit Boards oder Platzhaltern belegt sind.

Beschädigung des Systems
Durch hohe Luftfeuchtigkeit können Kurzschlüsse entstehen.
Betreiben Sie das System nur innerhalb der angegebenen Grenzwerte für die relative Luftfeuchtigkeit und Temperatur. Stellen Sie vor dem Einschalten des Stroms sicher, dass sich auf dem System und auf den Boards kein Kondensat befindet und starten Sie das System nicht unter 0ºC.

Stromschlaggefahr
Das System besitzt vier -48V bis -60V DC Anschlüsse. Alle Anschlüsse müssen vom System entfernt werden, um das System spannungsfrei zu schalten.
Um eine Verletzungsgefahr zu minimieren, entfernen Sie die Anschlüsse, wenn Sie das System ausschalten.

Beschädigung des Systems
Luftfilter
Verunreinigungen in der Luft können den Luftfilter verschmutzen und so die Luftzufuhr des Systems beeinträchtigen. Das kann zur Überhitzung des Systems und zu Schäden an Systemteilen führen.
Um einen reibungslosen Luftstrom durch das System zu gewährleisten, sollten Sie den Luftfilter spätestens alle sechs Monate austauschen. Artesyn empfiehlt, die Lüfter alle 90 Tage auszutauschen. Wie häufig Sie die Filter austauschen müssen, hängt von der Umgebung ab, in der das System betrieben wird. Da die Verhältnisse in Vermittlungsstellen sehr unterschiedlich sein können, sollten Sie die Luftfilter nach der Erstinstallation des Systems jede Woche kontrollieren. In einer staubigen Umgebung muss ein Filter gegebenenfalls öfter gereinigt

werden als in einer sauberen Umgebung. Prüfen Sie den Filter regelmäßig bis Sie eine Vorstellung davon haben, wie oft der Filter gereinigt werden muss. Erstellen Sie aufgrund Ihrer Beobachtungen einen Reinigungsplan und protokollieren Sie jede Reinigung oder jeden Austausch des Filters.

Überhitzung des Systems
Wenn Sie die Geschwindigkeit der Lüfter reduzieren, steigt die Systemtemperatur an. Kontrollieren Sie deshalb ständig die Temperatur im System, wenn Sie die Geschwindigkeit der Lüfter reduziert haben. Stellen Sie während des Betriebs sicher, dass die Bedingungen, die im Handbuch beschrieben sind, eingehalten werden.

Verletzungen oder Kurzschlüsse
Blade oder Stromversorgung
Falls die ORing Dioden des Blades durchbrennen, kann das Blade einen Kurzschluss zwischen den Eingangsleitungen A und B verursachen. In diesem Fall ist Leitung A immer noch unter Spannung, auch wenn sie vom Versorgungskreislauf getrennt ist (und umgekehrt).
Prüfen Sie deshalb immer, ob die Leitung spannungsfrei ist, bevor Sie Ihre Arbeit fortsetzen, um Schäden oder Verletzungen zu vermeiden.

Ausbau/Erweiterung

Systemüberlastung
Verhindern Sie eine Systemüberlastung, indem Sie die gesamte aufgenommene Leistung aller eingebauten Komponenten, also z.B. der installierten Blades und Laufwerke (siehe die technischen Daten der entsprechenden Komponente) überprüfen. Stellen Sie sicher, dass der Ausgangsstrom jedes Verbrauchers innerhalb der zulässigen Grenzwerte liegt.

Verlust der Sicherheitszulassung
Verwendung zusätzlicher Module
Wenn Sie zusätzliche Module und Boards verwenden, ist es möglich, dass das System nicht mehr den gültigen Sicherheits- und EMV Normen entspricht. Der Systemintegrator muss die Einhaltung der gültigen Normen sicherstellen.

Austausch von PEMs

Verletzungsgefahr durch Stromschlag und Verbrennungen
Berühren metallische Gegenstände an Händen, Handgelenken oder am Hals die Input Terminals der PEMs, kann dies zu extremen Verletzungen, wie zum Beispiel Verbrennungen oder Amputationen führen. Tragen Sie bei der Arbeit mit dem System keine metallischen Gegenstände an Ihren Händen oder Armen und lassen sie keine metallischen Gegenstände um Ihren Hals hängen. Seien Sie extrem vorsichtig mit elektrisch leitenden Gegenständen in der Nähe der PEMs.

Kurzschluß und Gefahr durch Stromschlag
Um einen elektrischen Schlag zu vermeiden, überzeugen Sie sich, dass vor dem Austausch des PEMs die Stromzufuhr unterbrochen ist und während des Austausches unterbrochen bleibt.

Kurzschluß und Gefahr durch Stromschlag
Um Kurzschlüsse und elektrischen Schlag zu vermeiden, überzeugen Sie sich, dass vor dem Lösen der Schrauben die Stromzufuhr unterbrochen ist und während des Austausches unterbrochen bleibt. Vermeiden Sie Kurzschlüsse, indem Sie sehr vorsichtig mit dem Werkzeug umgehen.

Beschädigung der Spannungsversorgungseinheit
Wir die Spannungsversorgungseinheit verkehrt angeschlossen, werden die Elektrolytkondensatoren der Filter beschädigt. Schalten Sie die Unterbrecher deshalb nur, wenn das rote Licht nicht sichtbar ist.

Lüfteraustausch

Verletzungsgefahr
Rotierende Lüfterschaufeln
Sie können verletzt werden, wenn Sie Werkzeuge oder Finger in laufende Lüfter einführen. Wenn Sie die Lüfterschublade aus dem Chassis ziehen, wird die Abdeckung der Lüfterschaufeln freigelegt. Berühren Sie die Lüfterschaufeln nicht.
Seien Sie vorsichtig nach dem Herausziehen des Lüfters, da die Zentrifugalkräfte noch wirken und somit die Handhabung erschweren können.

Verkabelung/Kabelführung

Verletzungsgefahr
Verändern Sie nie die von Artesyn ausgelieferte Verkabelung des Systems.
Stellen Sie sicher, dass die Verkabelung schon existierenden Kabelführungen folgt und bestehende oder ähnliche Befestigungen verwendet. Überprüfen Sie nach der Erweiterung der Verkabelung, ob das System ordnungsgemäß arbeitet.
Reduzieren Sie die Verletzungsgefahr, indem Sie Kabel so verlegen, dass niemand darüber stolpern kann.

Verletzungsgefahr durch Stromschlag
Durch das Berühren von Kontakten und Kabeln während des Betriebs können Sie einen elektrischen Schlag bekommen.
Schließen Sie in jedem Fall aus, dass Personen durch einen elektrischen Schlag verletzt werden können, indem Sie sicherstellen, dass Kontakte und Kabel des Systems während des Betriebs nicht berührt werden können.
Falls Sie Fragen bezüglich der Verkabelung haben, wenden Sie sich an die für Sie zuständige Geschäftsstelle von Artesyn.

Beschädigung der Kabel
Werden Kabel geknickt, kann das Kabel beschädigt werden und der Datentransfer nicht mehr stattfinden. Stellen Sie sicher, dass Kabel nicht geknickt werden.

RJ-45 Stecker

Beschädigung des Systems
Bei den RJ-45 Steckern, die sich auf den Boards befinden, handelt es sich entweder um Twisted-Pair-Ethernet (TPE) oder um E1/T1/J1-Stecker. Beachten Sie, dass ein versehentliches Anschließen einer E1/T1/J1 Leitung an einen TPE-Stecker Ihr System zerstören kann.

- Kennzeichnen Sie deshalb TPE-Anschlüsse in der Nähe Ihres Arbeitsplatzes deutlich als Netzwerkanschlüsse.
- Stellen Sie sicher, dass die Länge eines mit Ihrem Systems verbundenen TPE-Kabels 100 m nicht überschreitet.

- Das System darf über die TPE Stecker nur mit einem Sicherheits-Kleinspannungs-Stromkreis (SELV) verbunden werden.
- Bei Fragen wenden Sie sich an Ihren Systemverwalter.

Laser

Verletzungsgefahr

Wenn sich an der Rückseite Ihres Systems ein Aufkleber mit der Aufschrift CLASS 1 LASER PRODUCT befindet, beeinhaltet das System ein Bauteil mit einem Laser. Solche Bauteile enthalten Laserdioden, die unsichtbare und für die Augen schädliche Laserstrahlen abgeben. Falls Sie sich nicht an die Anweisung in diesem Handbuch halten, kann dies zu gefährlichen Strahlungsbelastungen führen. Schauen Sie niemals direkt in den Laserstrahl.

Batterieaustausch

Beschädigung der Boards
Ein unsachgemäßer Austausch von Batterien kann zu gefährlichen Explosionen und Beschädigung der Boards führen.
Verwenden Sie deshalb nur den Batterietyp, der auch bereits eingesetzt wurde und befolgen Sie die entsprechende Anleitung im Installationshandbuch des jeweiligen Boards.
Entsorgen sie alte Batterien entsprechend der in Ihrem Land gültigen Richtlinien.

Umweltschutz

Umweltschutz
Entsorgen Sie alte Blades, RTMs und Systeme gemäß der in Ihrem Land gültigen Gesetzgebung und den Empfehlungen des Herstellers.

Chapter 1

Platform Architecture

1.1 Description

The AXP640 is designed as an open standard platform on which to run applications in the Telecom Central Office environments. It combines existing PICMG standards featuring high speed serial data fabrics. These standards serve to streamline the architecture by eliminating the overhead of bridging, increasing payload, and eliminating the need for system and non system slot blades. This is accomplished by using the Intelligent Platform Management Interface (IPMI) and dual Ethernet star network which allows for communication between all node blades using Ethernet.

The AXP640 is a high-availability platform with special locations for Shelf Management Alarm Module (SAMs), six 8U x 280mm slots, six 8U x 70mm rear transition modules, Fan Tray Modules, (FTMs), and DC Power Entry Modules (PEM) or AC Power Supplies (PSU).

1.2 PICMG Compliance

The AXP640 is designed to be compliant with PCI Industrial Computers Manufacturer's Group (PICMG) specifications 3.0 and 3.1, and also provides support for PICMG 1.5.1 IPMI bus for system management.

1.3 Shelf Topology

Topology refers to the shape of a network, or the network's physical layout. The way that different nodes in a network are connected to each other and how they communicate are determined by the network's topology.

The backplane of the AXP640 uses a dual star topology that supports two independent networks. The dual star uses a point-to-point configuration with redundancy added for reliability. All devices on a star network are connected to a central connection point (hub). Nodes communicate across the network by passing data through the hub slot, which on the AXP640 contains a switching function that forwards packets to the appropriate port based on the packet's address. Switching hubs support traditional Ethernet (10 Mbps), Fast Ethernet (100 Mbps), Gigabit Ethernet (1000 Mbps) ports and 10G-KR (40 Gbps) ports.

1.4 Network Descriptions

This section describes the operational aspects of each of the shelf's network designs, based on the Base and Fabric interfaces.

1.4.1 Base Interface

NOTICE

The blade slots are numbered physically from 1 to 6 from the bottom going to the top of the shelf. Each slot also has a "logical" slot number that defines it for backplane connectivity; logical slot numbers are not shown on the shelf. Please note that the slots will be referred to by their physical slot location.

The base hub slots (physical slots 3 and 4) have four pairs of 1000Base-T signals to node slots which form the dual star topology fabric. Each of the node slots support two base channel interface signals that connect to each hub slot. In turn, the channel 1 base interface of each hub slot is connected to the SAM. Each of the hub slots support a total of six base channels.

The hub slots require connectors P20, P21, P23 and P24. The base node slots require only connectors P20 and P23.

1.4.2 Fabric Interface

The fabric interface supports point-to-point connections between AdvancedTCA blades. In the AXP640, these fabric connections are configured in a dual star topology that runs back to the hub slots. The AXP640 system has Option 9 channel slots. These channels are aggregated at the hub slots into the dual-star topology. In this configuration, all node slots support one fabric channel to each of the two hub slots.The fabric channels are located on connector P23 of the node slots, and connectors P20, P21, and P23 of the hub slots. 40 Gbps connectivity is supported.

The implementation of the interface is indicated by the level of PICMG compliance a blade or hub is designed. The AXP640 supports the PICMG 3.1 fabric standard to allow for several configuration options that can provide greater bandwidth to certain slots in the shelf. The fabric interface supports: PICMG 3.1 Option 9 (10Gbps).

1.4.3 IPMI Network

The Intelligent Platform Management Interface (IPMI) is based on a redundant radial topology. Redundant IPMI networks are supported by the Shelf Management Alarm Module (SAM) to manage the shelf resources.

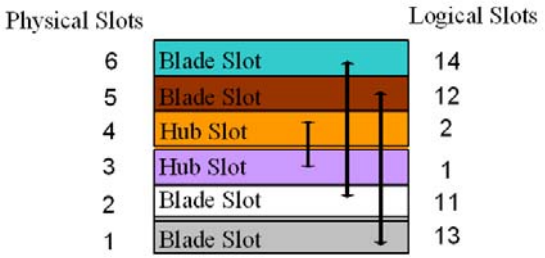
The SAM is the center of the IPMI network. The SAM connects to all slots in the shelf and monitors and reports on the content of the AXP640. The SAM collects environmental data from sensors within the shelf and can assist high availability software to determine when a failover is necessary due to hardware removal or environmental changes, such as an over-temp condition.

The SAMs contain the Shelf Management Controller (ShMC) which polls all devices resident to the shelf and collects the FRU data records for all the components. The SAM also manages non-IPMI devices for the shelf and performs environmental monitoring of the temperature and voltage. Using the PICMG 3.0 standard, the SAM is able to power off and reset slots for hot swap capability.

1.4.4 Update Channel Interface

The update channel interface consists of 10 differential pairs on the P20 connector. The physical layer and protocol used on this interface is application specific. Figure 1-1 illustrates the update channel inter-connectivity.

Figure 1-1 Update Channel



1.5 Backplane and Component Connectivity

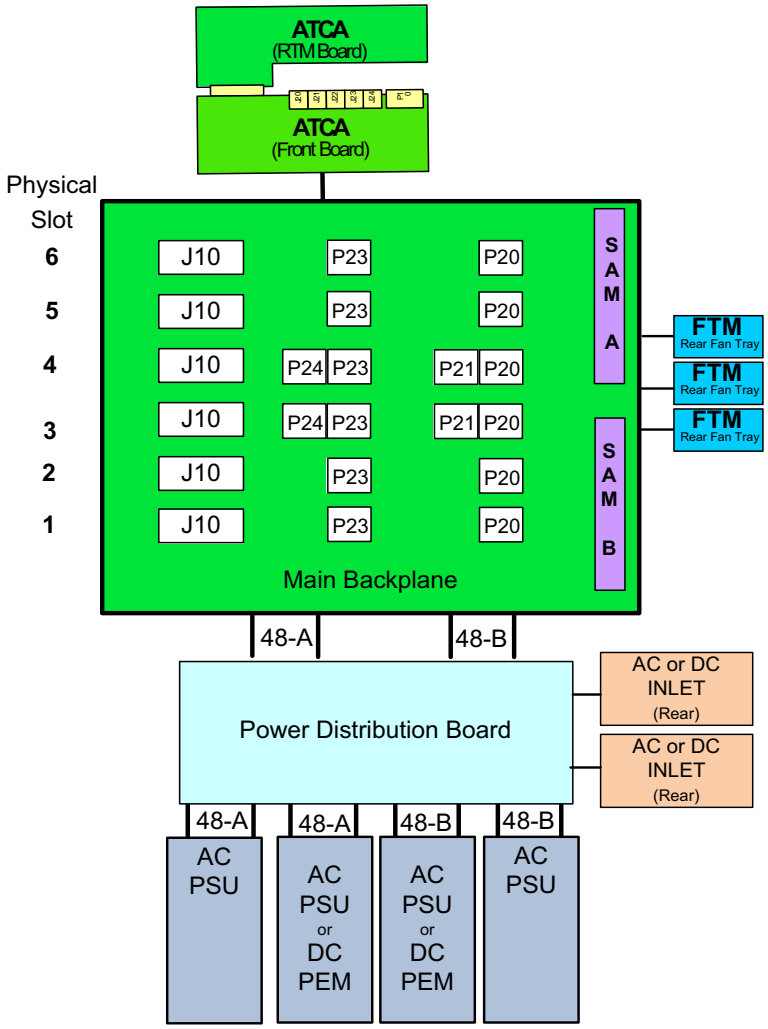
The blade connectivity on the AXP640 backplane is divided among three zones, each with the following characteristics:

- Zone 1 provides redundant, radial IPMI to all blade slots and redundant -48 VDC to all blade slots
- Zone 2, the data transport interface, provides the dual star configuration for the base interface, dual star configuration for the fabric interface, update channel routing for all blade slots, and three redundant, bussed telecom clock signals to all blade slots
- Zone 3 provides the PICMG 3.0 defined open area that is application specific

NOTICE

Rear Transition Modules connect directly with the connectors on the front-side blade and do not make the connection through the backplane.

Figure 1-2 AXP640 Inter-connectivity



1.6 Remote Management and Maintenance

The AXP640 supports remote critical management and maintenance procedures. This eliminates the need for on-site maintenance personnel to handle routine maintenance tasks. Remote access to networked functionality provides the ability to:

- Upgrade IPMI firmware flashed on the SAMs, PEMs, FTMs, node and hub blades
- Upgrade BIOS
- Access in-service application software upgrades
- Access IPMI event logs for performance monitoring
- Access custom designed-in functionality or event logs

1.7 Ordering Information

Table 1-1 Ordering Information

Marketing Number	Description
Shelf Products	
AXP640-DC2	ATCA shelf - 6 slot, 19", 7U, 40G, PP SHMM - Redundant DC PEM - Silver
AXP640-DC2-B	ATCA shelf - 6 slot, 19", 7U, 40G, PP SHMM - Redundant DC PEM - Black
AXP640-AC2-220VAC	ATCA shelf - 6 slot, 19", 7U, 40G, PP SHMM - Redundant AC PSU (220 VAC) - Silver
AXP640-AC2-220VAC-B	ATCA shelf - 6 slot, 19", 7U, 40G, PP SHMM - Redundant AC PSU (220 VAC) - Black
AXP640-AC2-110VAC	ATCA shelf - 6 slot, 19", 7U, 40G, PP SHMM - Redundant AC PSU (110 VAC) - Silver
AXP640-AC2-110VAC-B	ATCA shelf - 6 slot, 19", 7U, 40G, PP SHMM - Redundant AC PSU (110 VAC) - Black
Accessory and FRU Products	
AXP-F-FILL-PANEL	Blank filler panel, AXP1620, AXP1440, AXP141x, AXP640, C2000 - Front - Silver

Table 1-1 Ordering Information (continued)

Marketing Number	Description
AXP-R-FILL-PANEL	Blank filler panel, AXP1620, AXP1440, AXP141x, AXP640, C2000 - Rear - Silver
PEM640	DC power entry module for the AXP640
PSU640	AC power supply unit for the AXP640
FTM640	Fan tray module for AXP640 - Silver
FTM640-B	Fan tray module for AXP640 - Black
SAM640	Shelf manager module for the AXP640 - Silver
SAM640-B	Shelf manager module for the AXP640 - Black
RAF640-SET	Replaceable air filters (set of two) for the AXP640
BEZEL640-B	Front bezel for the AXP640 - Black
AXP640-RKMT-FR-19	Front mounting brackets for the AXP640 for a 19" rack (set of two)
AXP640-RKMT-FR-23	Front mounting brackets for the AXP640 for a 23" rack (set of two)
AXP640-RKMT-MID-19	Mid-mounting brackets for the AXP640 for a 19" rack (set of two)
AXP640-RKMT-MID-23	Mid-mounting brackets for the AXP640 for a 23" rack (set of two)
CABLE/RJ45/DSUB/6E	Adapter cable - RJ45 to DSUB9 female (needed to connect e.g. a laptop to serial interface of SAM) (RoHS 6/6)
AC-PC-15A-AUS-ZEL	AXP640 - AC power cord, 15 amps, 250 volts, Australia & New Zealand connector
AC-PC-16A-EU	AC power cord, 16 amps, 250 volts, EU connector
AC-PC-20A-PIGTAIL	AXP640 - AC power cord, right angle, 20 amps, 250 volts, pigtail
AC-PC-20A-US	AC power cord, 20 amps, 125 volts, US & Canada connector

AXP640 Shelf Description

2.1 Overview

The AXP640 Shelf supports six AdvancedTCA blade slots, of which four are I/O node slots that can be populated with task CPU processor blades, network processor blades, or any other blade designed for a specific application, and two slots for the system controller and switching blades. There are slot locations next to the AdvancedTCA slots in the front of the shelf for the two SAMs. All slots comply with PICMG 3.0 for power distribution and form factor and use the PICMG 3.1 for Ethernet and Dual Star interface. The shelf's other components include fan trays, DC PEMS or AC PSUs, and front and rear cable management trays.

2.2 Platform Features

The AXP640 includes the following features:

- 6-slot card cage with six rear transition module (RTM) slots
- Two Shelf Management Alarm Modules (SAMs)
- Up to four single entry AC power supplies or two DC Feed Power Entry Modules (PEMs) with 60A breaker and line filter
- Fan Trays Modules (FTMs), three located at the rear of the chassis
- Front access service and installation of blades and lower fan tray
- Rear access service and installation of FTMs
- Cable management, front and rear
- Telco alarms located on the SAM faceplate
- Filler panels for front and rear slots
- Telco dry relay connector located at the rear of the chassis

The following figure shows the location of each of the components in the AXP640.

Figure 2-1 Front Shelf View

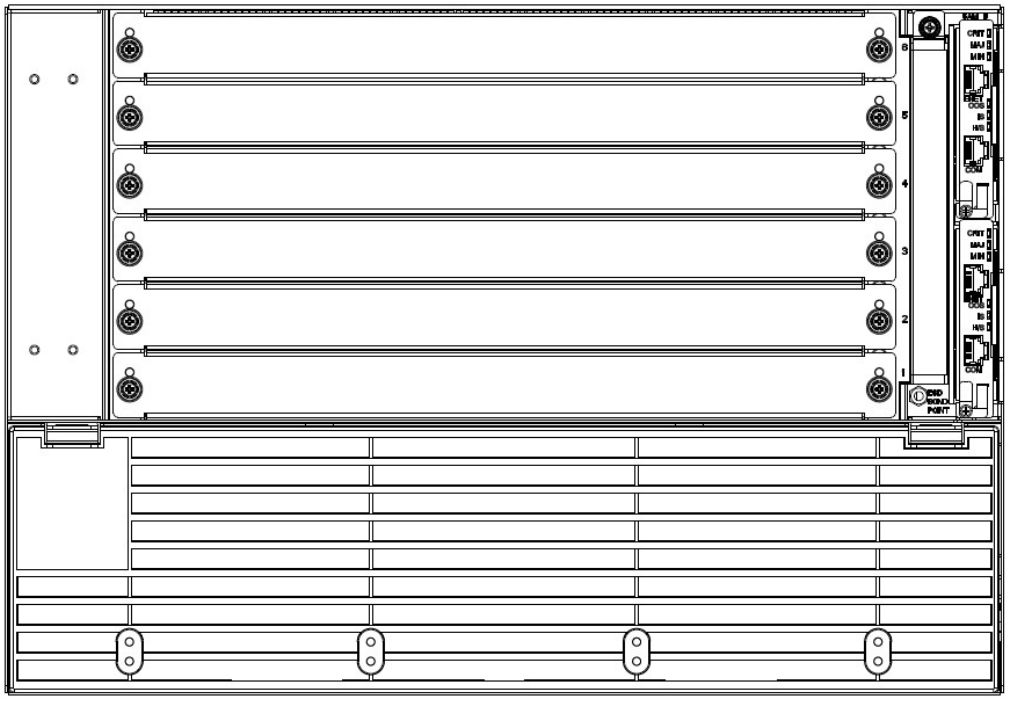


Figure 2-2 DC Rear Shelf View

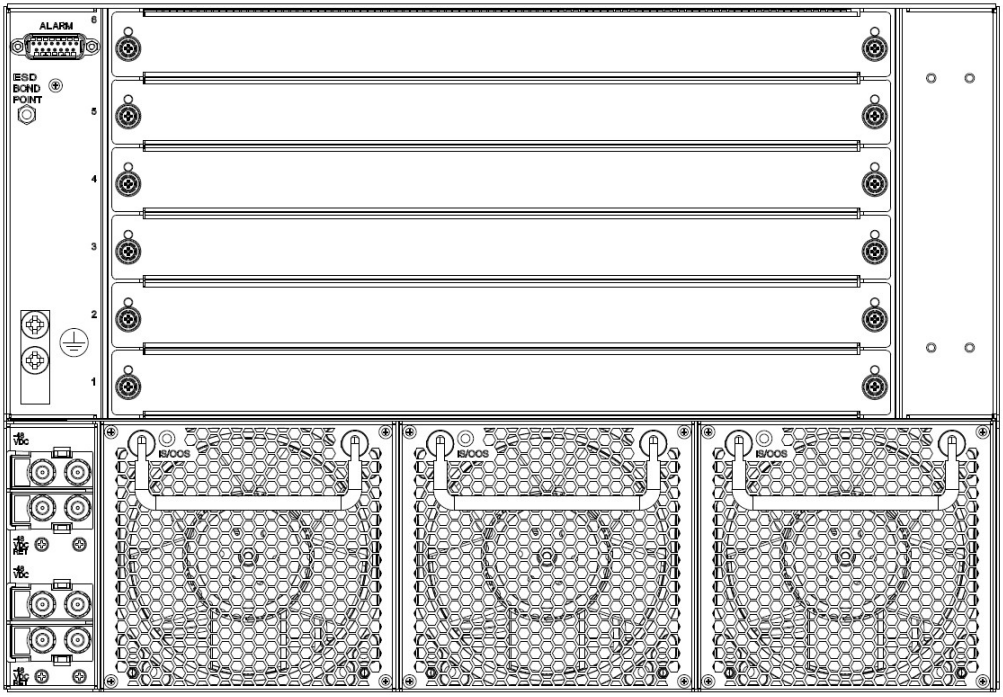
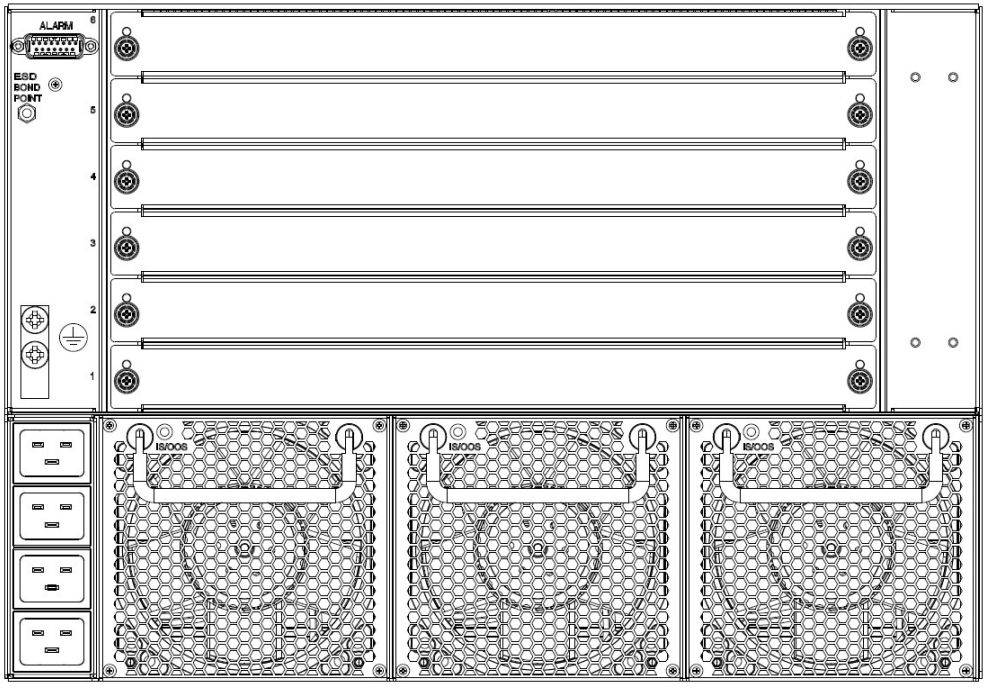


Figure 2-3 110V AC Rear Shelf View



2.3 Enclosure

The AXP640 shelf consists of a formed 6U sheet metal card cage with structure and support for the backplane, PEMs/ PSUs, FTMs, SAMs, and six card slots. Figure 2-1 on page 52 provides a front view of the shelf.

The enclosure mounts in either a 600mm x 600mm ETSI frame relay rack, EIA 23" rack, or EIA 19" rack. Mounting holes for bezel brackets are provided, which allows the use of power supply or card cage (customer designed) bezels.

2.4 Power Consumption

The following table shows the total power requirements for the shelf. Power consumption breakdown is shown in the following tables.

Table 2-1 DC Shelf Power

FRU	Nominal Power (W) Shelf Only	Maximum Power (W) Shelf with Payload
PEM Subsystem	2.5	10
Fan Subsystem	45	360
Shelf Management	6	20
ATCA Blades (6 at 350W)		2100
Total Shelf Power	53.5	2490

Table 2-2 AC Shelf Power, Low Line

FRU	Nominal Power (W) Shelf Only	Maximum Power (W) Shelf with Payload
PSU Subsystem	7.65	248
Fan Subsystem	45	360
Shelf Management	6	20
ATCA Blades (6 at 350W)		2100
Total Shelf Power	58.65	2728

2.5 Shelf Ground Configuration

The AXP640 shelf was tested in the default configuration of logic ground and shelf ground connected and does not connect -48VDC Return with Shelf Ground. The AXP640 platform has been tested in the default configuration and complies with safety and regulatory standards.

As a compliant AdvancedTCA shelf, the AXP640 allows system integrators, at their own discretion, to remove the mechanism which connects Logic Ground to Shelf Ground and/or install the mechanism that connects -48VDC Return to Shelf Ground. If the system integrator exercises the option of removing the connections from Logic Ground to Shelf Ground or adds

the connection between -48VDC Return and Shelf Ground, the responsibility for maintaining compliance to CSA (C/US)/VDE safety requirements and EMI/RFI emission limits rests entirely with the system integrator and installer. For more information, contact your Artesyn sales representative.

2.6 Backplane

The shelf backplane supports two hub slots, four node slots, and two SAMs. This AdvancedTCA backplane provides the IPMB and I^2C bus interface signals from the shelf manager to all AdvancedTCA blades and the other FRUs. The backplane provides signal routing for fail-over signals between active SAM and standby SAM. The backplane is not a Field Replaceable Unit (FRU).

2.6.1 Functional Layout

The backplane provides dual star base interface and dual star fabric interface connections at each blade slot with segmented power (two power segments) provided by the dual Power Entry Modules (PEMs) or AC PSUs.

The blade slots are numbered physically from 1 to 6 going bottom to top along the front of the shelf. Numbers on slots 3 and 4 designate the hub slots. Each slot also has a “logical” slot number that defines it for backplane connectivity; logical slot numbers are not shown on the shelf. The backplane power routing is shown in the following figures.

Figure 2-4 Power Distribution

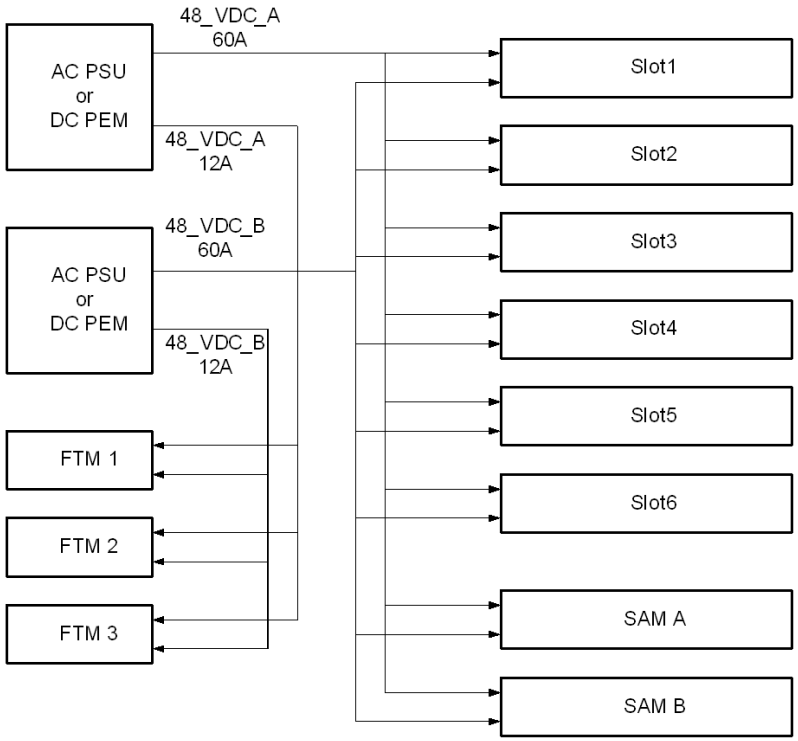
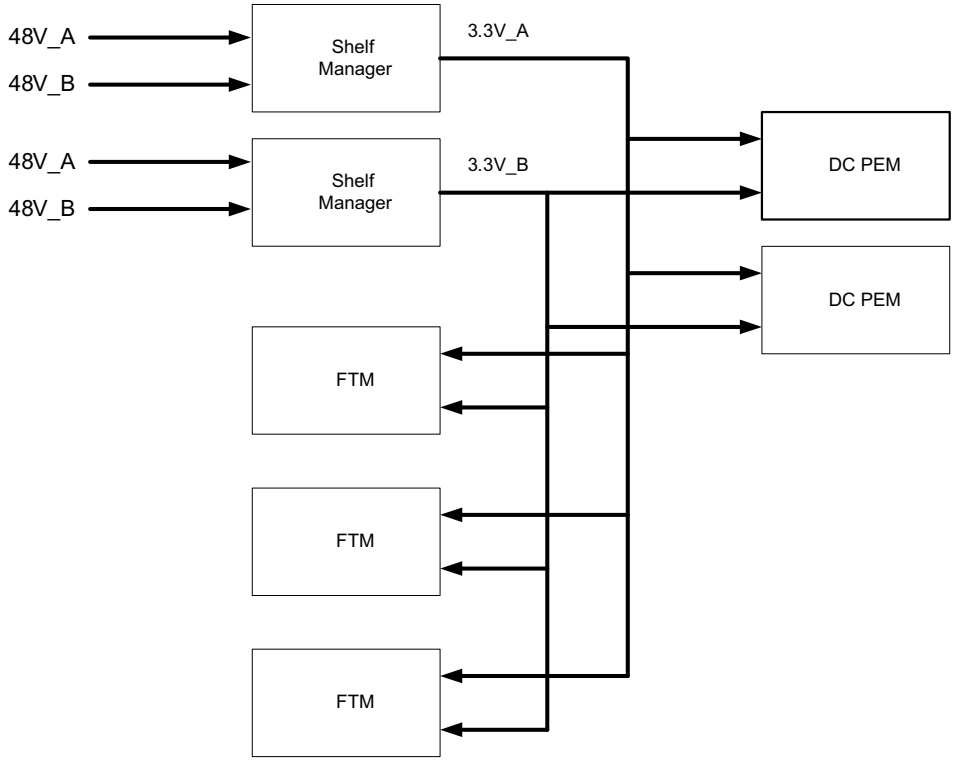


Figure 2-5 Management Power Distribution



2.6.2 E-Keying

The AXP640 supports the shelf management infrastructure with a process called E-Keying. E-Keying replaces the mechanical connector keying method used in earlier backplane designs. E-Keying prevents damage to blades, prevents misoperation, and verifies fabric compatibility.

E-Keying entries are present as FRU information in the shelf FRU and all blades present in the shelf. The E-Keying entries describe the Base Interface, Fabric Interface, Update Channel Interface as implemented by the shelf and blades. E-keying allows blades that support different PICMG 3 standards to be used in the same shelf.

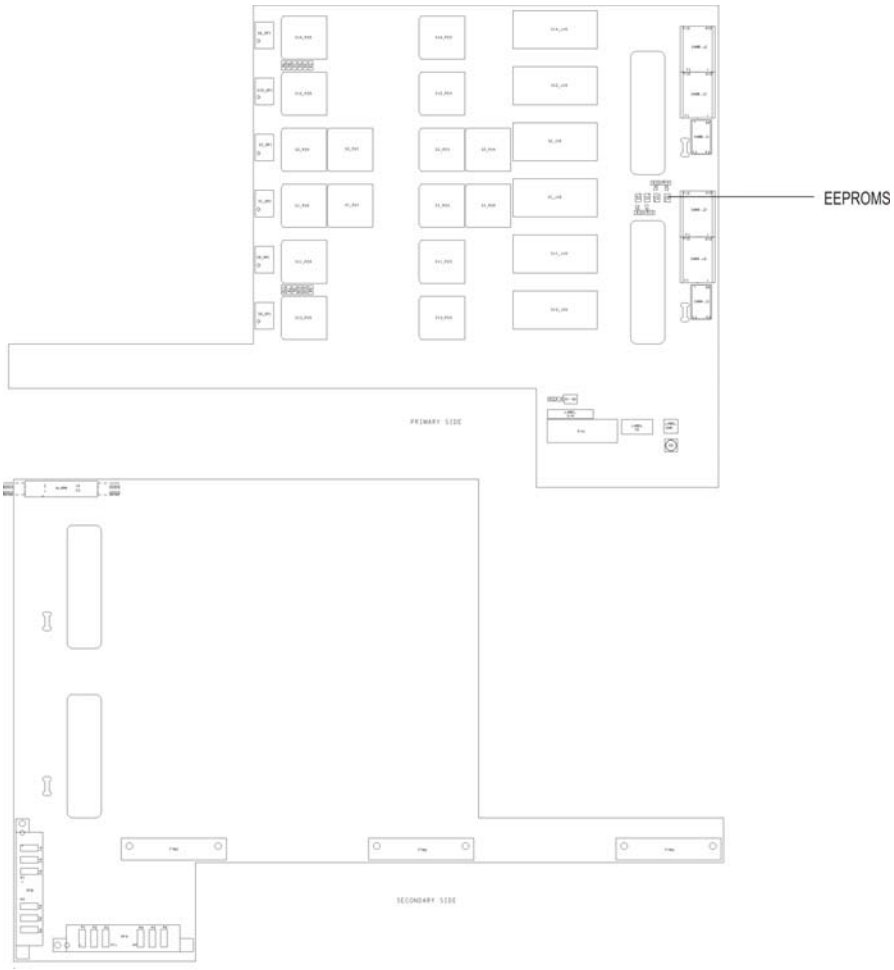
More detailed information, such as connectivity and requirements for E-Keying can be found in PICMG 3.0 R1.0 AdvancedTCA Specification and the *AXP640 Subsystem IPMI Programmer's Reference* listed in Appendix A, *Related Documentation*.

2.6.3 Shelf FRU Information

The SEEPROMs containing the shelf FRU information are located on the backplane. This information is accessed by using the standard IPMI FRU commands over the IPMC. Refer to the *AXP640 Subsystem IPMI Programmer's Reference* listed in Appendix A, *Related Documentation*.

The SAM queries all IPMCs during system startup to determine whether they are a source of shelf FRU information and then uses that information to complete initialization. The information is cached as FRU 254 on the active ShMC (0x20). The information in the SEEPROM is only needed when the SAMs are first inserted or when the shelf is powered on for the first time. The redundancy feature provides the shelf-specific information should one SEEPROM be nonfunctional.

Figure 2-6 EEPROMS in Backplane



2.6.4 Backplane Slot Connectors

The following table provides a summary of what resides on each of the slot connectors.

Table 2-3 Slot Connector Description

Connector	Slots 3 and 4 (Physical) Switches	Slots 2, 5-6 (Physical) Node
J10	Power, IPMB, Hardware Address	Power, IPMB, Hardware Address
P24	Base	N/A
P23	Fabric and Base	Fabric and Base
P22	N/A	N/A
P21	Fabric	N/A
P20	Clocks, Update, Fabric	Clocks, Update

Table 2-4 Hardware Addressing

Logical Slot	Physical Slot	Hardware Address	Site Number	Site Type	HA7	HA6	HA5	HA4	HA3	HA2	HA1	HA0
1	3	41h	1	00h	OPEN	OPEN	Gnd	Gnd	Gnd	Gnd	Gnd	OPEN
2	4	42h	2	00h	OPEN	OPEN	Gnd	Gnd	Gnd	Gnd	OPEN	Gnd
11	2	4Bh	3	00h	Gnd	OPEN	Gnd	Gnd	Gnd	Gnd	OPEN	OPEN
12	5	4Ch	4	00h	OPEN	OPEN	Gnd	Gnd	Gnd	OPEN	Gnd	Gnd
13	1	4Dh	5	00h	Gnd	OPEN	Gnd	Gnd	Gnd	OPEN	Gnd	OPEN
14	6	4Eh	6	00h	Gnd	OPEN	Gnd	Gnd	Gnd	OPEN	OPEN	Gnd
	FTM	1	1	04h						Gnd	Gnd	OPEN
	FTM	2	2	04h						Gnd	OPEN	Gnd
	FTM	3	3	04h						Gnd	OPEN	OPEN
	PEM 1	1	1	01h							GND	OPEN
	PEM 2	2	2	01h							OPEN	Gnd
	SAM 1	1	1	03h							Gnd	OPEN
	SAM 2	2	2	03h							OPEN	Gnd

2.6.5 Zone Locations on a Blade

The backplane provides dual star Base Interface and dual star Fabric Interface connections at each slot with segmented power (two power segments) provided by the DC PEMs or AC PSUs.

- Zone 1 provides the system management and power interfaces, such as redundant -48VDC power and IPMB
- Zone 2, the data transport interface, provides the Base and Fabric interfaces, Update Channels, and clock synchronization through the ZD connectors per front-side blade
- Zone 3 provides the direct interconnect for user designated I/O

NOTICE

Rear Transition Modules connect directly with the connectors on the front-side blade and do not make the connection through the backplane.

Figure 2-7 illustrates the base channel inter-connectivity.

Figure 2-7 Base Channel

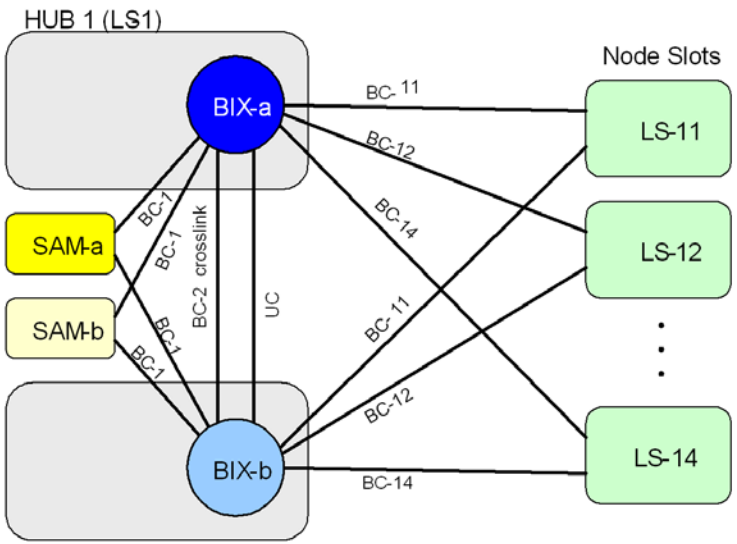
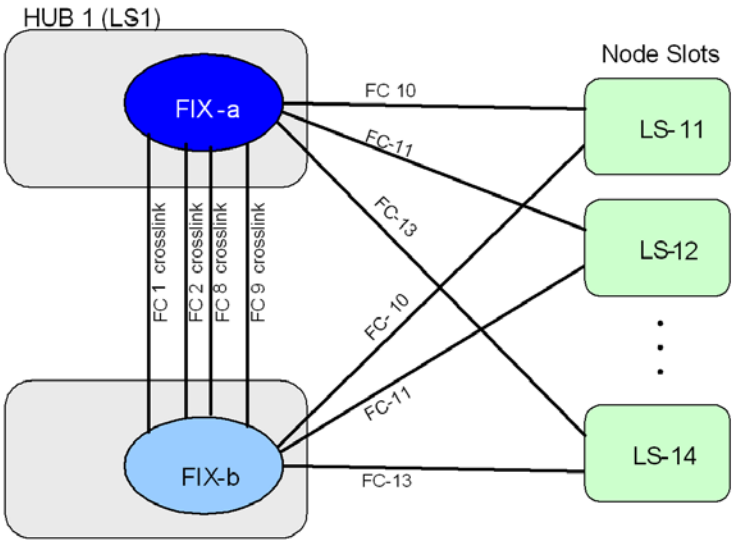


Figure 2-8 illustrates the fabric channel inter-connectivity.

Figure 2-8 Fabric Channel



2.7 IEEE802.3ap 10GBASE-KR

The AXP640 backplane is designed to support 40Gb traffic through 10GBASE-KR.

2.8 Fan Tray Modules (FTMs)

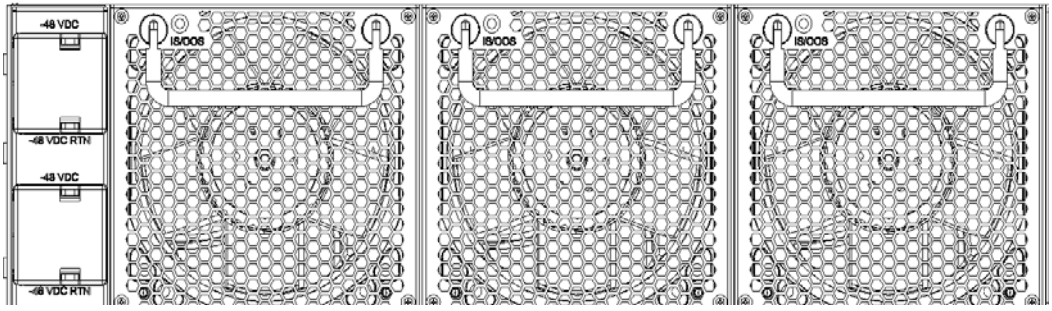
The AXP640 supports three fan trays in a pull configuration. Each fan tray contains a single 120 mm fan.

The FTM is hot swappable and may be managed through the IPM Sentry software for hot swap. If your system is not running high-availability software, behavior of the LED may be indeterminate. The face plate of the FTM has the following indicators:

Table 2-5 FTM LED Status Indicator

FTM LED	LED Color	State/Condition
In-Service (IS)	Green	Off: no service Glow Steady: service available
Out-of-Service (OOS) and Failure	Red (default)	Off: service available Glow Steady: no service

Figure 2-9 Fan Tray Module, Rear View



2.9 Power Entry Modules (PEMs)

The PEM is a Field Replaceable Unit (FRU) and can be replaced while the system is on, but the power for the PEM being replaced (PEM A or PEM B) must be shut down at the external source prior to replacement. Replacement can take place in under 30 minutes by a trained service person.

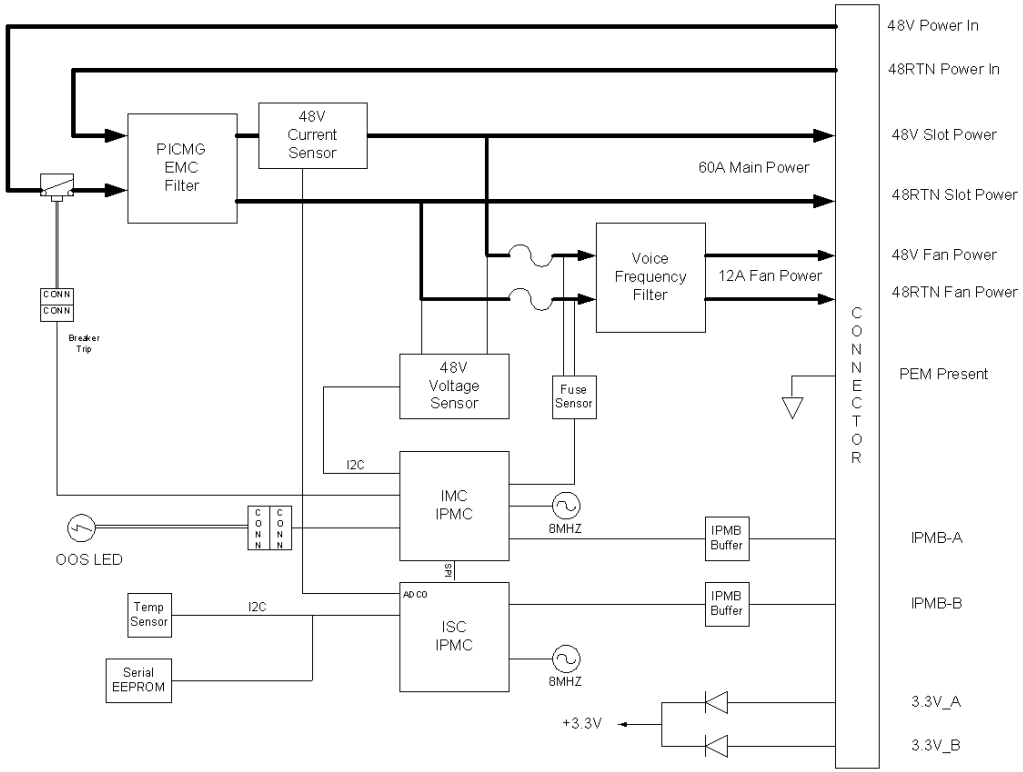
For important information on removing power before replacing a PEM, refer to *Powering Down the System* on page 105 and *DC Power Entry Module (PEM)* on page 106.

The PEMs are accessible from the front of the shelf. Power supplied to the PEM enters the chassis from the rear on the DC inlet 2-hole lugs. A removable plastic housing covers the power feeds and returns to prevent accidental shorting on the DC inlet. Once power is removed at the external source, the PEM may be removed and replaced from the front of the shelf.

Each PEM powers two separate power domains A and B and each domain supports 60A power rails to supply power to the AdvancedTCA slots.

The PEMs are hot-swappable and will not cause a fault when one is removed for replacement. Two PEMs are required to support 2N redundancy. If your system is configured for redundant operation using two power feeds, they operate in load sharing where the total load is equal to or less than what one power feed can provide.

Figure 2-10 PEM Connectivity



Each of the PEMs are equipped with a single rocker type circuit breaker and a single bi-colored LED. When the breaker is switched off, power is removed from the feed to the backplane. Input power to the PEM is only removed through the external source feeding the shelf at the DC inlet.

Table 2-6 PEM LED Status Indicator

FTM LED	LED Color	State/Condition
In-Service (IS)	Green	Off: no service Glow Steady: service available
Out-of-Service (OOS) and Failure	Red (default)	Off: service available Glow Steady: no service

2.9.1 Power Inlet Modules

The power inlet building block supports redundant power connection to the shelf from the rear. It routes the power paths individually to two high current connectors which mate directly with the front installed AC power supply/ DC power entry module. The power inlet is a fixed, non-field replaceable unit.

Figure 2-11 illustrates the DC inlet at the rear of the shelf.

Figure 2-11 DC Inlet

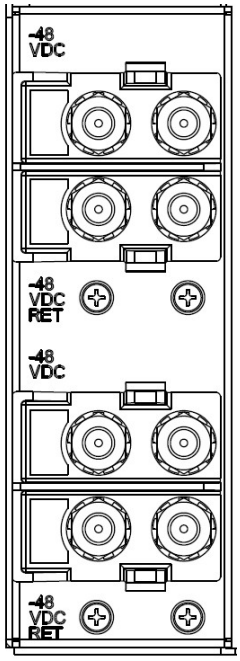


Figure 2-12 and Figure 2-14 illustrates the AC inlet at the rear of the shelf.

Figure 2-12 AC Inlet (110V)

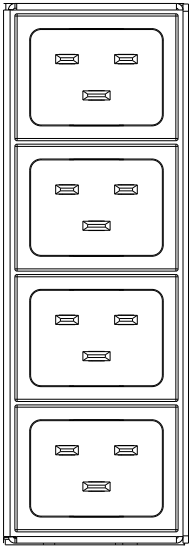


Figure 2-13 AC Inlet Markings (110V)

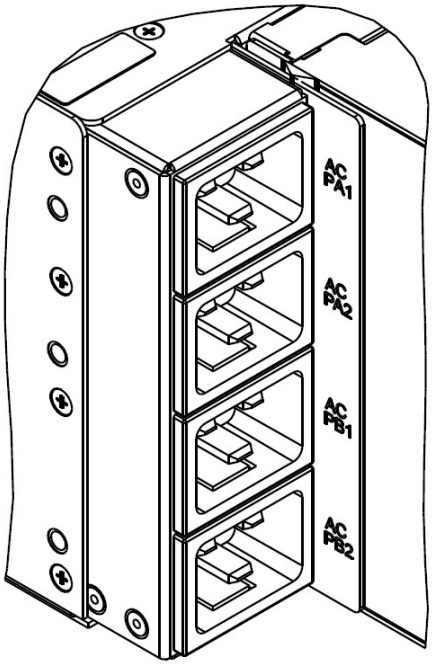


Figure 2-14 AC Inlet (220V)

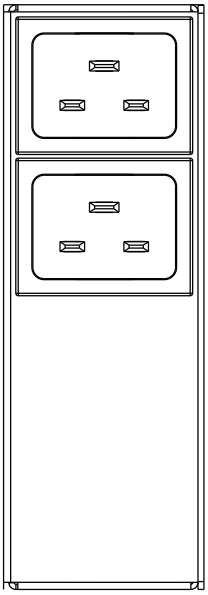
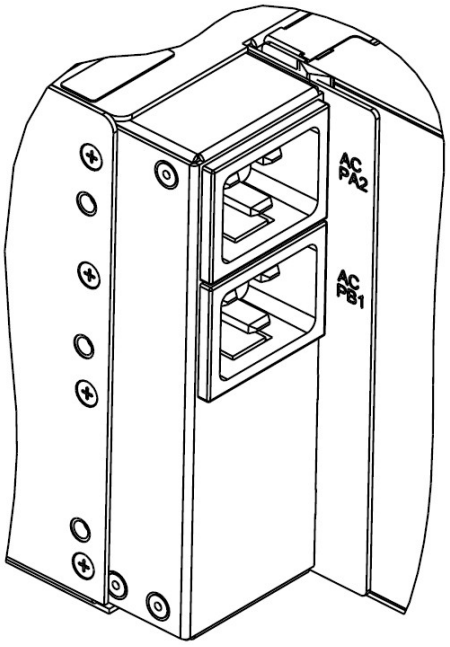


Figure 2-15 AC Inlet Markings (220V)



2.10 Stationary Boards

There are two stationary boards in the shelf which are completely passive and are not field replaceable:

- Backplane
- Power distribution board

2.11 Standard Compliances

The AXP640 AdvancedTCA platform complies with the safety and regulatory standards as shipped from the factory. It is possible to use this product with other components that produce a system not in compliance with system guidelines. Since Artesyn Embedded Technologies cannot anticipate what equipment may be used with this enclosure or how it may be used, the responsibility for designing a system that conforms overall to the safety requirements, EMI/RFI emission limits, and other applicable standards rests entirely with the system integrator and installer.

Table 2-7 Standard Compliances

Standard	Description
PICMG 3.0	Defines mechanics, board dimensions, power distribution, power and data connectors, and system management.
UL 60950-1 EN 60950-1 IEC 60950-1 CAN/CSA C22.2 No 60950-1	Safety Requirements (legal)
AS/NZS CISPR 22 CISPR 22 CISPR 24 EN 55022 EN 55024 EN 300 386 FCC Part 15 Industry Canada ICES-003 VCCI Japan	EMC requirements (legal) on system level (predefined Artesyn Embedded Technologies system)
ETSI ETS 300 753 ETSI EN 300 019 series	Environmental Requirements
ETSI EN 300 132-2	Power requirements

Table 2-8 Designed to Comply with Standard

Standard	Description
NEBS Standard GR-1089 CORE	EMC requirements (legal) on system level (predefined Artesyn Embedded Technologies system)
NEBS Standard GR-63-CORE	Environmental Requirements

To fulfill the requirements of Telcordia GR-1089,R4-14, use Shielded Twisted Pair (STP) cables grounded at both ends to connect to the Ethernet ports.

The following figures contains the Declaration of Conformity for AXP 640 AC and AXP 640 DC .

Figure 2-16 Declaration of Conformity - AC

EC Declaration of Conformity

According to EN 17050-1:2004

Manufacturer's Name:	Artesyn Embedded Technologies Embedded Computing
Manufacturer's Address:	Zhongshan General Carton Box Factory Co. Ltd. No 62, Qi Guan Road West, Shiqi District, 528400 Zhongshan City Guangdong, PRC

Declares that the following product, in accordance with the requirements of 2004/108/EC, 2006/95/EC, 2011/65/EU and their amending directives,

Product:	ATCA AC 6 Slot Shelf
Model Name/Number:	AXP640-AC Series

has been designed and manufactured to the following specifications:

EN55022: 2006 (A1: 2007)

EN55024:1998 (A1: 2001 + A2: 2003)

ETSI EN 300 386 V1.5.1 (2010-10)

EN 61000-3-2: 2006 (A2: 2009)

EN 61000-3-3: 2008

IEC 60950-1:2005 (2nd Edition), EN60950-1:2006+A11:2009

2011/65/EU RoHS Directive

As manufacturer we hereby declare that the product named above has been designed to comply with the relevant sections of the above referenced specifications. This product complies with the essential health and safety requirements of the above specified directives. We have an internal production control system that ensures compliance between the manufactured products and the technical documentation.

Tom Tuttle, Manager, Product Testing Services

05/20/2014
Date (MM/DD/YYYY)

CE

ARTESYN EMBEDDED TECHNOLOGIES

Figure 2-17 Declaration of Conformity - DC

EC Declaration of Conformity

According to EN 17050-1:2004

Manufacturer's Name:	Artesyn Embedded Technologies Embedded Computing
Manufacturer's Address:	Zhongshan General Carton Box Factory Co. Ltd. No 62, Qi Guan Road West, Shiqi District, 528400 Zhongshan City Guangdong, PRC

Declares that the following product, in accordance with the requirements of 2004/108/EC, 2006/95/EC, 2011/65/EU and their amending directives,

Product:	ATCA DC 6 Slot Shelf
Model Name/Number:	AXP640-DC Series

has been designed and manufactured to the following specifications:

EN55022: 2006 (A1: 2007)

EN55024:1998 (A1: 2001 + A2: 2003)

ETSI EN 300 386 V1.5.1 (2010-10)

IEC 60950-1:2005 (2nd Edition), EN60950-1:2006+A11:2009

2011/65/EU RoHS Directive

As manufacturer we hereby declare that the product named above has been designed to comply with the relevant sections of the above referenced specifications. This product complies with the essential health and safety requirements of the above specified directives. We have an internal production control system that ensures compliance between the manufactured products and the technical documentation.

Tom Tuttle, Manager, Product Testing Services

05/20/2014
Date (MM/DD/YYYY)

CE

ARTESYN EMBEDDED TECHNOLOGIES

2.12 WEEE Compliance

To satisfy the requirements for marking electrical and electronic equipment in accordance with article 11 (2) of Directive 2002/96/EC, Waste from Electrical and Electronic Equipment (WEEE), Artesyn Embedded Technologies includes a crossed-out bin symbol on all standard and non-custom chassis product. This marking fulfills the requirement set out by WEEE that a producer of an electrical or electronic appliance that bears their trade name and is put on the European Union market after 13 August 2005, places a clearly identifiable mark on the equipment and that this mark signifies that equipment is to be reprocessed or recycled using authorized recyclers and processes. This minimizes the disposal of unsorted municipal waste, achieves a high level of separate collection of WEEE, and ensures the environmentally sound disposal of electrical and electronic equipment placed on the market after 13 August 2005.

To dispose of equipment marked with the WEEE symbol, Artesyn Embedded Technologies has contracted with certified companies that can reprocess this equipment per European Union requirements. Please visit the Artesyn Embedded Technologies web site or contact your Artesyn Embedded Technologies representative to find out who to contact and how to dispose of the equipment.

Figure 2-18 DC Rating Label

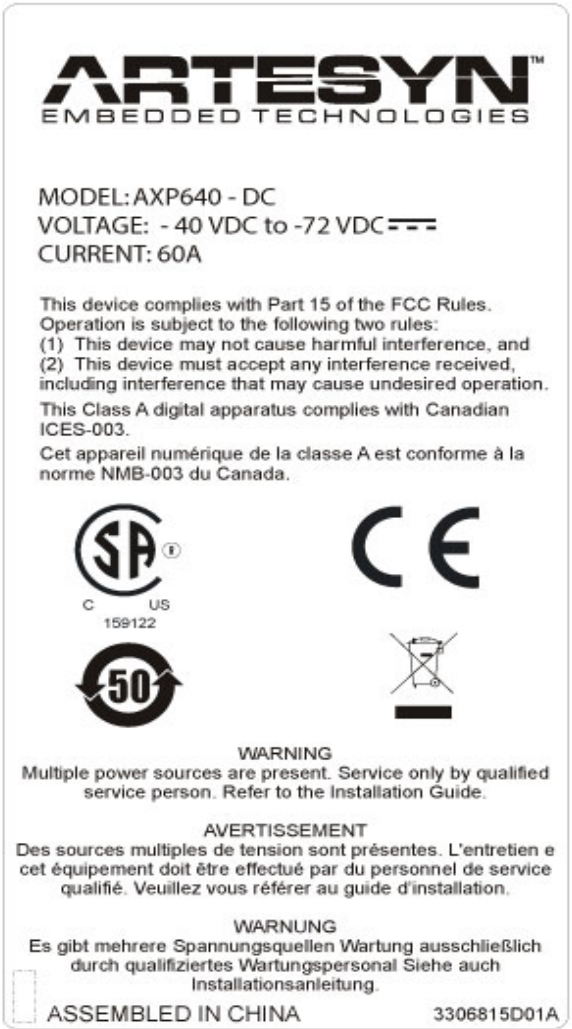
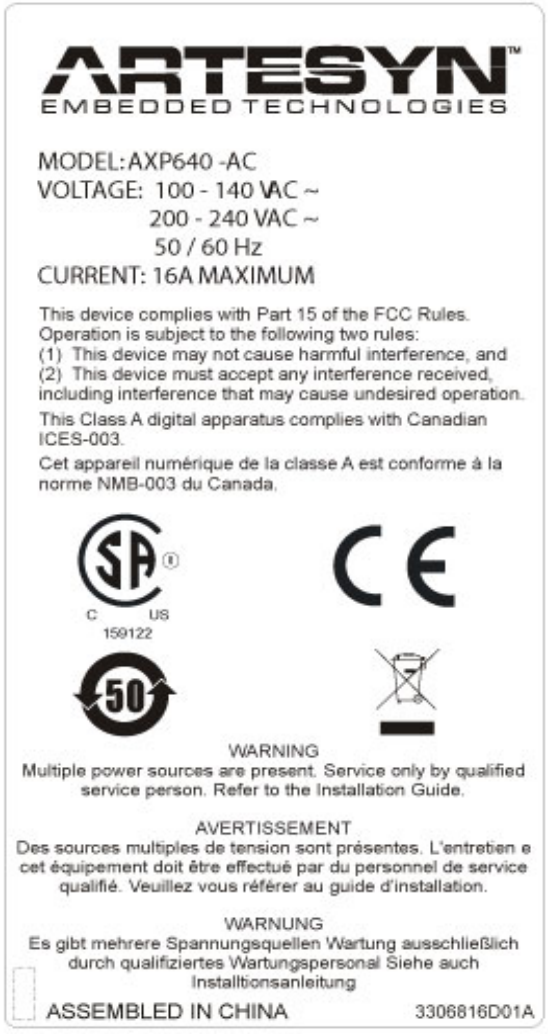

ARTESYN
EMBEDDED TECHNOLOGIES
MODEL: AXP640 - DC
VOLTAGE: - 40 VDC to -72 VDC
CURRENT: 60A
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two rules:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.
This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.
C US
159122
50
WARNING
Multiple power sources are present. Service only by qualified service person. Refer to the Installation Guide.
AVERTISSEMENT
Des sources multiples de tension sont présentes. L'entretien e cet équipement doit être effectué par du personnel de service qualifié. Veuillez vous référer au guide d'installation.
WARNUNG
Es gibt mehrere Spannungsquellen Wartung ausschließlich durch qualifiziertes Wartungspersonal Siehe auch Installationsanleitung.
ASSEMBLED IN CHINA
3306815D01A

Figure 2-19 AC Rating Label


ARTESYN
EMBEDDED TECHNOLOGIES
MODEL: AXP640 -AC
VOLTAGE: 100 - 140 VAC ~
200 - 240 VAC ~
50 / 60 Hz
CURRENT: 16A MAXIMUM
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two rules:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.
This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.
C US
159122
WARNING
Multiple power sources are present. Service only by qualified service person. Refer to the Installation Guide.
AVERTISSEMENT
Des sources multiples de tension sont présentes. L'entretien e cet équipement doit être effectué par du personnel de service qualifié. Veuillez vous référer au guide d'installation.
WARNUNG
Es gibt mehrere Spannungsquellen Wartung ausschließlich durch qualifiziertes Wartungspersonal Siehe auch Installtionsanleitung
ASSEMBLED IN CHINA
3306816D01A

3.1 Overview

The following sections help you to prepare system installation:

Section	Gives Information On
Site Planning Considerations	This section includes information on unpacking and inspecting the system, requirements, technical data, and other information you need to know before you start system installation.
Site Planning Checklists	This section provides checklists for site preparation.

3.2 Site Planning Considerations

This section provides information to prepare the site and the shelf for installation.

3.2.1 Receiving and Unpacking the System

Carefully inspect the system and all components delivered together with it.

⚠ CAUTION

Personal Injury or System Damage
The system is heavy and if you carry it on your own you can hurt your back.
To prevent injury, keep your back straight and have two people lift the system or use additional lifting equipment.

Personal or System Damage
Unstable system installation in a rack can cause the rack to topple over.
Therefore, if your system is the only one in the rack, make sure to mount the system in the lowest part of the rack. If other systems are installed in one rack, start with the heaviest component at the bottom.
If the rack is equipped with stabilizing devices, make sure that they are installed and extended so that the rack is secure. Then proceed to mount or service the system.

Do not tilt the system forward or backward when removing it from the system package as the FRU ejector handles at the bottom could be damaged.

NOTICE

Damage of Circuits
Electrostatic discharge and incorrect RTM installation and removal can damage circuits or shorten their life.
Before touching the RTM or electronic components, make sure that you are working in an ESD-safe environment.

Shipment Inspection

To inspect the shipment perform the following steps:

1. Verify that you have received all items of your shipment.
   Compare the shipment thoroughly with the delivery note.
2. Visually inspect the shelf to ensure that all of the connector pins are straight, shrouds are properly seated, screws are tight, and so on.
3. Check the rails for proper alignment.
4. Check that the air filter is properly installed.
5. Check that the cable connections are secure and properly fitted.
6. Check the EMI gaskets for damage.
7. Check the items listed above for damage and report any damage or differences to the customer service at www.artesyn.com/computing.

8. Tighten loose screws before proceeding.
9. Remove the desiccant bags delivered together with the system and dispose of them according to your country's legislation.

The system is thoroughly inspected before shipment. If any damage occurred during transportation or any items are missing, please contact our customer's service immediately.

3.2.2 Site and Installation Planning

Planning basic site and installation requirements you have to consider the following issues:

- Adequate power should be available for the AXP640 system.
- For AC, the system should be positioned in a way that 100 VAC to 240 VAC power source is easy to reach.
- For DC, the system should be positioned in a way that -48 VDC to -60 VDC power source is easy to reach.
- There should be sufficient space in racks to install the system.
- Suitable equipment should be available to lift the system into the rack.
- There should be unrestricted area for inlet and outlet of the fans and therefore the airflow is not blocked.
- For Installation in restricted access location.
- For use by trained personnel.

3.2.3 Requirements

Before and during system installation and operation, you always have to ensure that the requirements listed in the following sections are met.

3.2.3.1 Environmental Requirements

To ensure proper function of the system, make sure that the environment in which the system is to be used fulfills the environmental requirements.

The environmental values must be tested and proven in the planned system configuration, that is, the delivered system and other third-party products you want to integrate.

- Operating temperatures refer to the temperature of the air circulating at the air intake of the system and not to component temperatures.
- Some of the climatic values may exceed the specification of some system components (for example, hard disks). As Artesyn Embedded Technologies cannot guarantee the functionality of third party products that are handled or operated out of their specifications, the environmental conditions may be limited to the specifications of these components.

The following table lists the environmental requirements.

Table 3-1 Environmental Conditions

Feature	Operating	Non-Operating (packed state)
Temperature	+5ºC (41°F) to +40ºC (104°F) (normal operation) according to NEBS standard GR-63-CORE -5°C (23°F) to +55°C (131°F) (exceptional operation) according to NEBS standard GR-63-CORE	-40°C (-40°F) to +70°C (158°F)
Temp. change	+/-0.25°C/min according to NEBS standard GR-63-CORE	+/-0.25°C/min
Relative humidity	5% to 90% non-condensing according to Artesyn Embedded Technologies-internal environmental requirements	5% to 95% non-condensing according to Artesyn Embedded Technologies-internal environmental requirements
Shock	Half-sine, 11 ms, 30 m/s^2	Blade level packaging Half-sine, 6 ms at 180 m/s^2

Table 3-1 Environmental Conditions (continued)

Feature	Operating	Non-Operating (packed state)
Vibration (tested in target platform)	0.1g from 5 Hz to 100 Hz and back to 5 Hz at a rate of 0.1 octave/minute	5-20 Hz at 0.01 g^2/Hz 20-200 Hz at -3.0 dB/octave Random 5-20 Hz at 1m^2/s^3 Random 20-200 Hz at -3 dB/octave
Free fall	-	300mm (11.8 in) (packaged) 25mm (1 in) (unpackaged) per GR-63-CORE fully populated system
Noise	ETSI ETS 300 753 (October 1997) Telecommunication equipment rooms (attended): 7.2 bel Measurement of "declared A-weight sound power level" All values are applicable to normal operating conditions (~23°C). NEBS GR-63-CORE, Issue 3 Telecommunication equipment rooms (attended): 78 dB Measurement of "declared A-weight sound power level" All values are applicable to normal operating conditions (~27°C).	-

- The ambient temperature is defined as the air inlet temperature.
- The AXP640 system regulates the fan speed based on the temperature sensors present in the system. The fan speed is adjusted to the lowest speed which still keeps the evaluated temperature readings below or at their respective "upper non-critical threshold". Hence, the fan speed depends on the ambient temperature, blade design, temperature threshold settings, and system configuration.

To guarantee proper blade operation, you have to make sure that the temperatures at the locations specified in the following are not exceeded. If not stated otherwise, the temperatures should be measured by placing a sensor exactly at the given locations.

Table 3-2 Critical Temperature Limits

Component	Temperature Limit
Air inlet (system's front)	55°C (131 °F)
Air outlet (system's rear)	70°C (158 °F) >70°C (158 °F) and maximum 90°C (194 °F): the cables must be isolated and must be approved to be used in this temperature range. >70°C (158 °F) and maximum 90° (194 °F): the service personnel may touch the components: the cables must be isolated and the "hot surface" icon must be attached. The cables must be approved to be used in this temperature range.

3.2.3.2 Power Requirements

For AC, make sure that 180 - 264 VAC or 90 - 140 VAC rated power source is within reach of the system. For DC, make sure that a suitable -48.0 VDC to -60 VDC rated power source is within reach of the system. Four power supply units (PSUs) at 90 to 140 VAC or two PSUs may be installed at 180 to 264 VAC, or two DC power entry modules (PEM) can be installed in the system.

⚠ WARNING

Personal or System Damage

- AXP640 AC:
  - The system is supplied by an AC voltage. External wiring shall be compliant to all requirements of National Electric Code (NEC).
- AXP640 DC:
  - The system is supplied by a TNV-2 voltage. This voltage is considered hazardous. Make sure that the external power supply meets the relevant safety standards. Ensure that TNV-2 is separated from dangerous voltages (mains) through double or reinforced insulation.

Table 3-3 AXP640 DC Power Requirements

Feature	Value
Rated voltage and current	-40VDC to -60VDC (SELV) -60VDC to -72VDC (TNV-2) 60A
Operating voltage range	-40.0 to -72VDC

Table 3-4 AXP640 AC Power Requirements

Feature	Value
Rated voltage and current	100 VAC to 140 VAC,180 VAC to 264 VAC, 50/60 Hz, 16 Amps
Operating voltage range	90VAC to 154 VAC, 180 VAC to 264 VAC

When installing additional blades or modules, make sure that the power consumption of all installed modules does not exceed the system's maximum power dissipation.

3.2.4 Dimensions and Weight

The table below lists the dimensions and weight of the shelf and system components.

The maximum weight of the system must not exceed 208 lbs.

Table 3-5 Dimensions and Weight of System and Components

Component	Dimensions w x h x d in mm	Weight
AC Low-line configuration ● 640 chassis ● Four AC PSUs ● Two SAMs ● Three FTMs ● Front bezel	448 x 310 x 493 (without front cable tray)	26.5 kg / 58.5 lbs
AC High-line configuration ● 640 chassis ● Two AC PSUs ● Two SAMs ● Three FTMs ● Front bezel	448 x 310 x 493 (without front cable tray)	22.5 kg / 50 lbs
As Shipped DC configuration ● 640 Chassis ● Two DC PEMs ● Two SAMs ● Three FTMs ● Front bezel	448 x 310 x 493 (without front cable tray)	22 kg / 49 lbs
Fan Tray Module	133 x 122 x 163	0.970 kg / 2.14 lbs
SAM	18 x 89 x 319	0.245 kg / 0.54 lbs
DC PEM	107 x 40 x 303	1.445 kg / 3.19 lbs
640 AC PSU	107 x 40 x 316	1.915 kg / 4.22 lbs

3.2.5 Mounting Options

You can simply operate the system on your desk or you can install it in a standard 23" rack.

NOTICE

During the course of handling, shipping, and assembly, pins, shrouds and mounting screws, fans and other items can become loose or damaged.
Do not operate a damaged shelf, this can cause damage to devices that interfere with it.

Grounding
To ensure the system is properly grounded, each of the system's parts contact the EMI gasket. The system contains gaskets at the shelf and module level.
The shelf is also fitted with ESD contacts. Please take care for proper ESD protection of the operator.

You have to keep in mind the following conditions when installing the system into a 600 mm ETSI rack, 19" rack or 23" rack. The physical dimensions in the figures below are in millimeters.

Figure 3-1 ETSI Frame Mount (Front View)

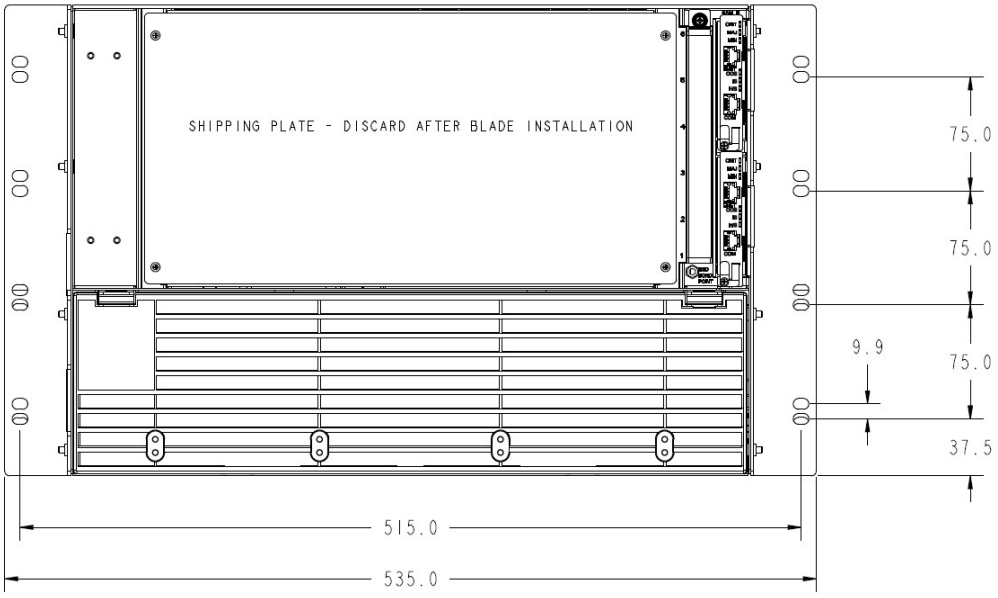


Figure 3-2 ETSI Frame Mount (Rear View)

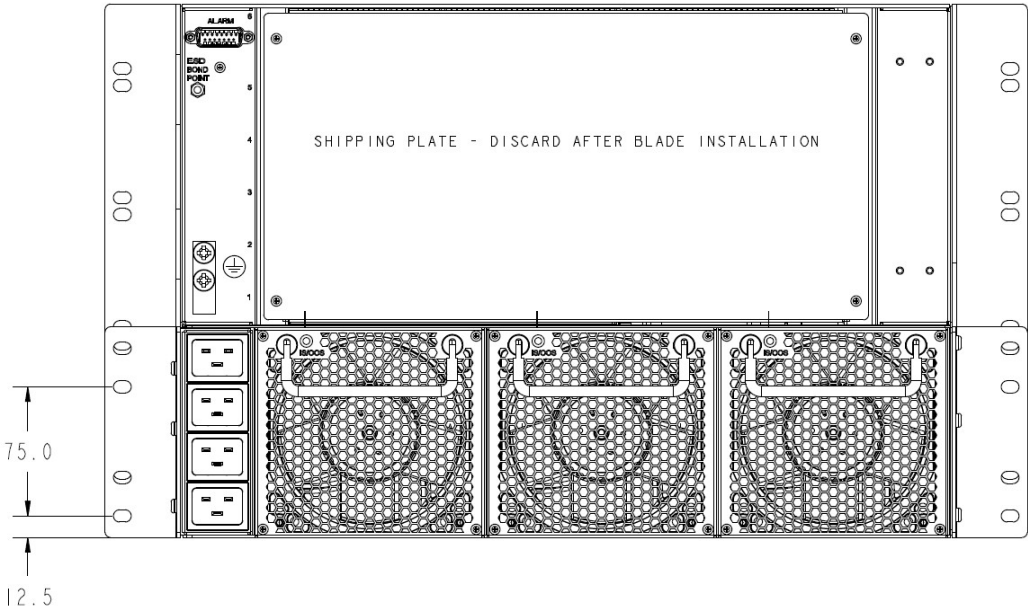


Figure 3-3 ETSI Frame Mount (Side View)

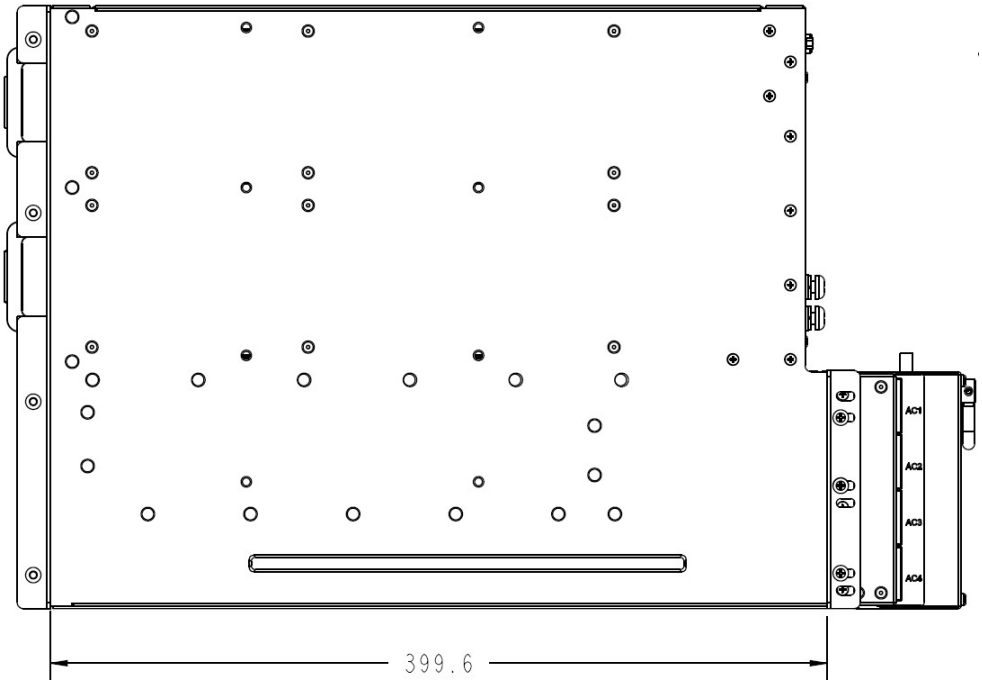


Figure 3-4 19-inch Frame Front Mount (Front View)

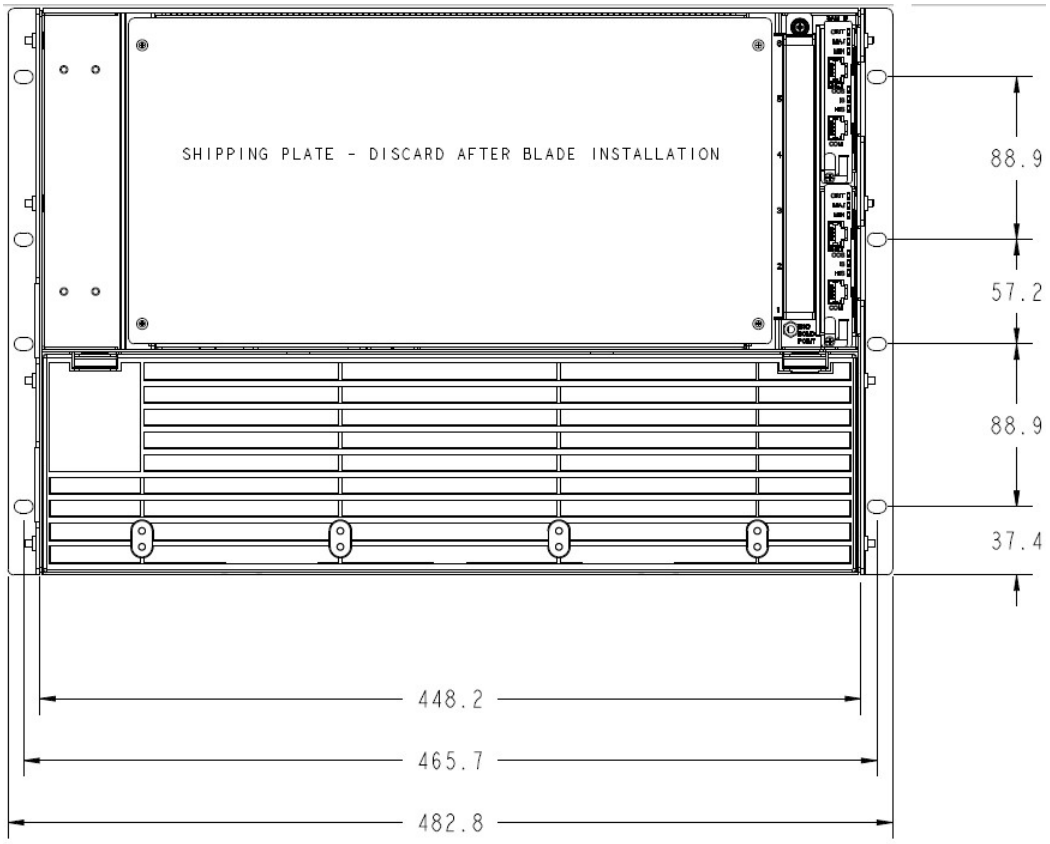


Figure 3-5 19-inch Frame Mid-mount (Front View)

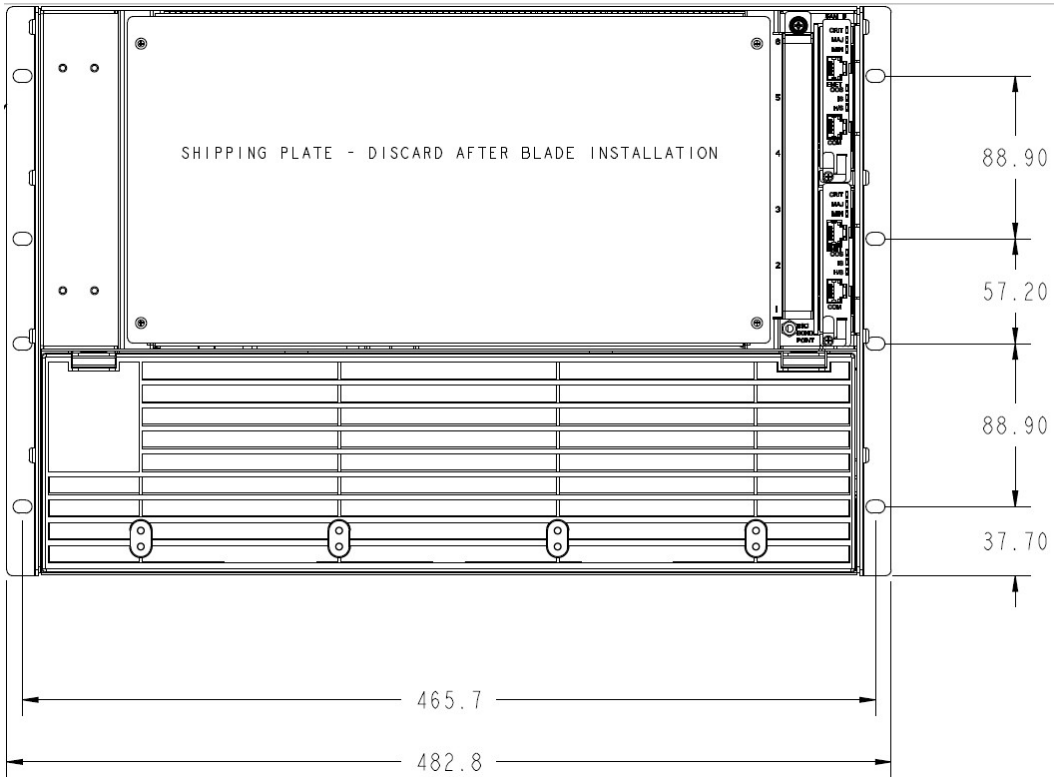


Figure 3-6 19/23-inch Frame Mid-mount (Side View)

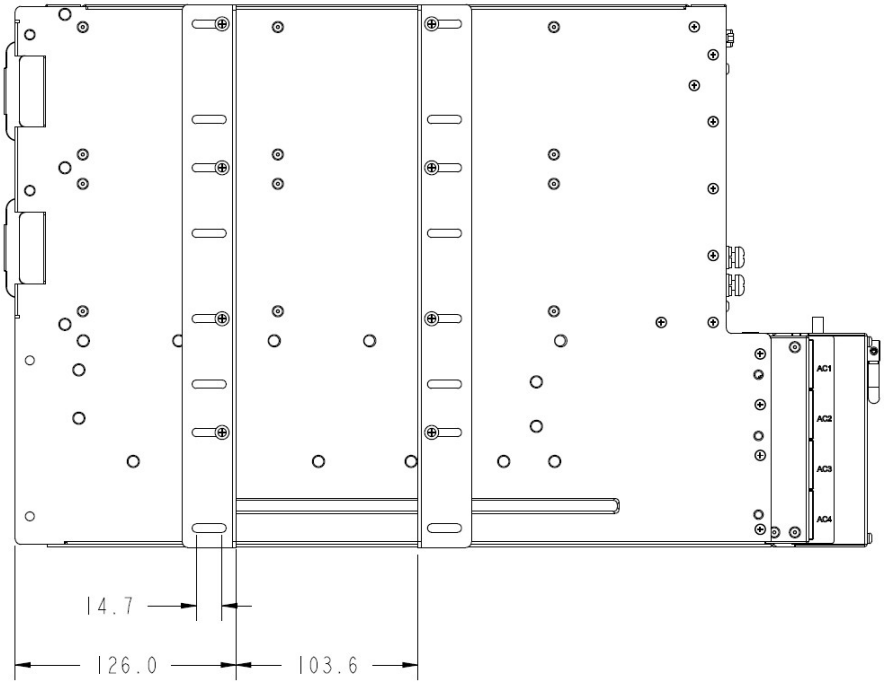


Figure 3-7 23-inch Frame Front Mount (Front View)

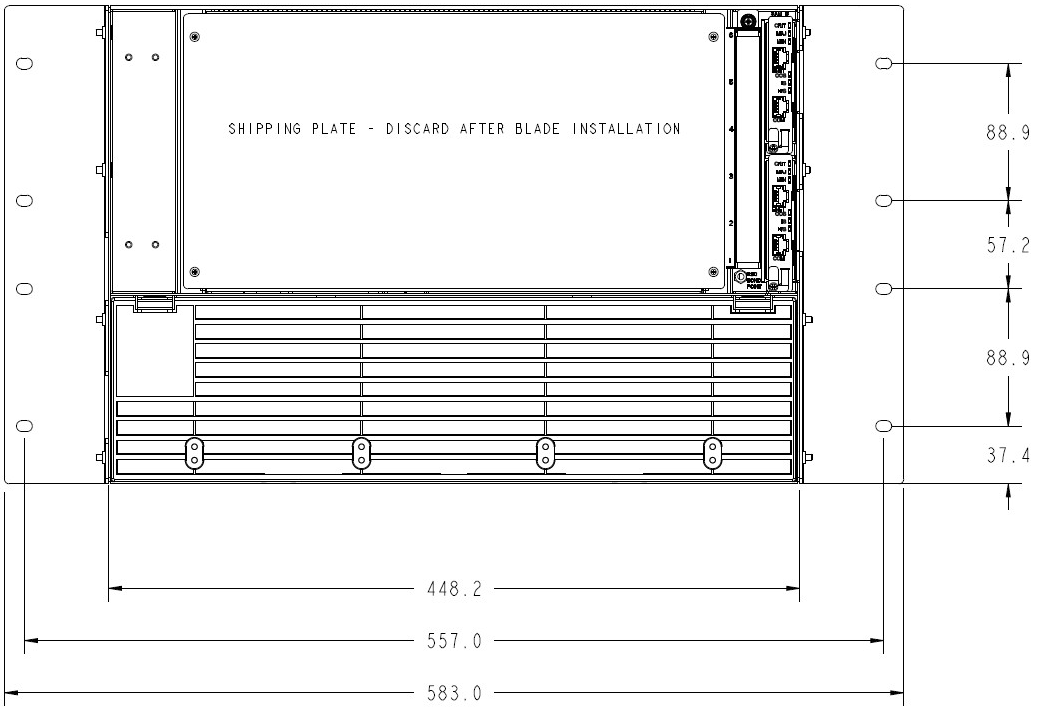
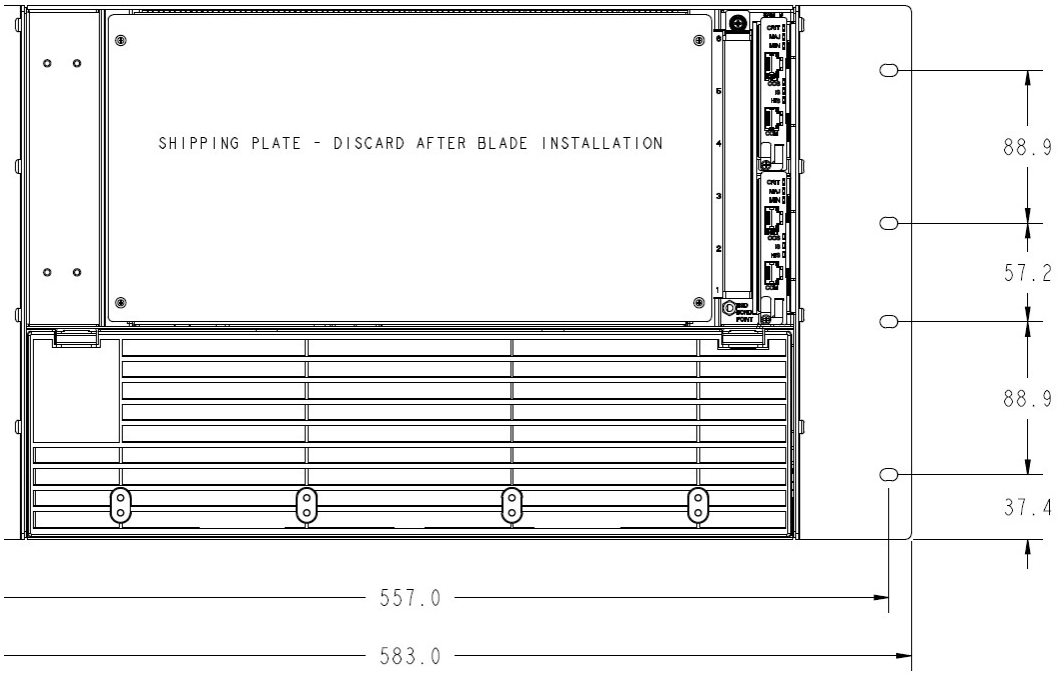


Figure 3-8 23-inch Frame Mid-mount (Front View)



3.2.6 Airflow Requirements

The AXP640 provides fault tolerant cooling to front-mounted AdvancedTCA blades and to rear transition modules based on three rear maintainable intelligent fan trays.

Fan trays are mounted in the rear of the shelf. The following figures show the general airflow for the system.

Figure 3-9 Shelf Airflow - Inlet

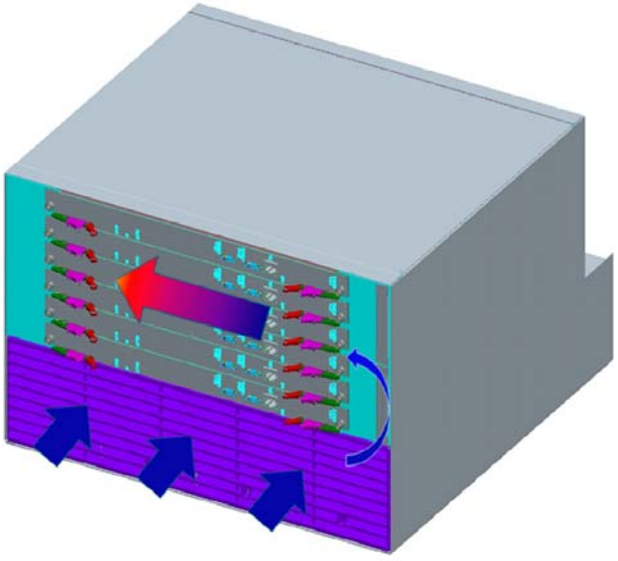


Figure 3-10 Shelf Airflow - Exhaust

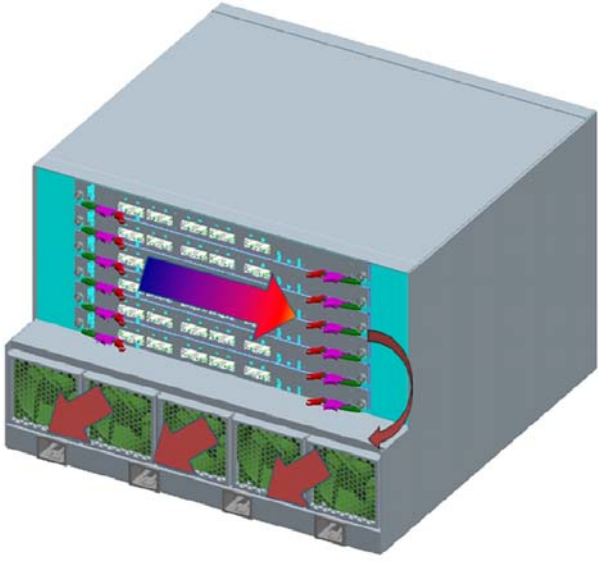
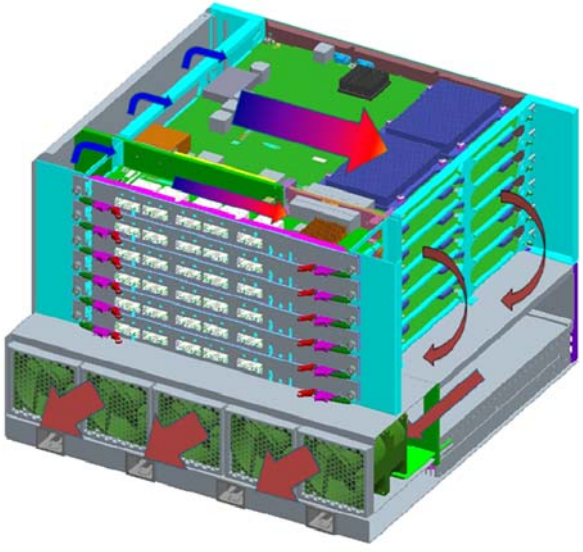


Figure 3-11 Shelf Airflow



The cooling subsystem is compliant to CP-TA B.4. The cooling system provides for greater than 40 CFM for the front blade and 5.0 CFM for the RTM.

The actual cooling performance depends on the slot population and the heat sink design of installed blades and should be validated based on the used configuration.

The distance to other equipment must be sufficient to avoid an overheating of the system.

The cooling subsystem provides greater than 24 CFM in the front slots in the presence of any single fan failure.This exceeds the CP-TA B.4 specification.

3.2.7 Acoustic Noise Control

The system can generate a lot of acoustic noise. This system has a built-in noise control due to the fan speed control. If the system is installed in an environment where the noise may be harmful to personnel being exposed to the noise during extended time periods, additional protective measures should be considered.

3.3 Site Planning Checklists

The following table lists the tasks which you have to perform as plan the installation of the system.

Figure 3-12 Planning Checklist 1

Planning Step	Done
Determine where to install the system and ensure that the required installation tools and equipment are available	☐
Control the available installation tools and equipment	☐
Ensure that enough space is available	☐
Determine the needed power	☐
Plan the cable management	☐
Ensure proper cooling	☐
Schedule the arrival of the system	☐
Consider consulting of Emerson services	☐

Figure 3-13 Planning Checklist 2

Issue	Entry
General site review	
Order number	
Schedules shipping date	
Installation date	
Site address	
Company name	
Special Instructions	
Operational days	
Contact data	
Contact name	
Phone number	
Fax number	
E-Mail address	
Site constructions	
What floor?	
Path to the installation area clear?	
Freight elevator available?	
How many shelves must be installed?	
Enough space available?	
DC or AC available	
All required cables available?	
To be continued	

AXP640 Operations

4.1 Overview

This chapter provides the basic operating procedures for the AXP640. For software-specific information, or information regarding the operation of third-party or add-on components, please refer to the software or hardware product's vendor documentation. You can refer to Appendix A, *Related Documentation* for a collection of supporting manuals.

This chapter covers the following topics:

- *Recommended Power-On Procedures*
- *Powering Down the System*
- *AC Power Supply (PSU)*
- *DC Power Entry Module (PEM)*
- *Fan Tray Modules*
- *Air Filter Maintenance*

4.2 Recommended Power-On Procedures

The following sections describes the startup procedure for AXP640 AC and AXP640 DC systems.

4.2.1 AC System Startup Procedure

Procedure

Depending on the system configuration, the actual powering up may take up to 3 minutes. Make sure that the system has been placed in a location at room temperature for at least 24 hours before powering it up.

1. Mount the grounding cable to the Protective Earth connection lug if not done already.
2. Make sure that the external power feeds you plan to attach are powered off and

cannot be switched on while you are working.

3. Connect the AC International Electric Code (IEC) wired connector to the AC power supplies.

4.2.2 DC System Startup Procedure

Procedure

Depending on the system configuration, the actual powering up may take up to 3 minutes. Make sure that the system has been placed in a location at room temperature for at least 24 hours before powering it up.

1. Mount the grounding cable to the Protective Earth connection lug if not done already.
2. Set the breakers on the PEM face plates to the OFF (tripped) position if they are not already in this position.
3. Make sure that the external power feeds you plan to attach are powered off and cannot be switched on while you are working.
4. Attach the power cables with 2 hole lugs to the DC power inlet in the rear of the shelf.

NOTICE

Ensure that the DC and DC return are connected correctly. Applying reversed power causes damage to the electrolytic capacitors of the filter

5. Energize the power feeds at the external device.
6. Push the DC PEM breakers to the ON position.

4.3 Powering Down the System

For data integrity reasons Artesyn Embedded Technologies recommends to save data and close all applications before powering down the system.

AC System Power-Down Procedure

To power down the AC system, proceed as follows:

1. Power down all inserted and active blades using a system management software.
2. Remove power from the system utilizing the external disconnect.
3. Verify that the LEDs of the PSUs are off.

⚠ CAUTION

The system may be supplied with multiple power sources. Ensure to remove power from all sources to completely remove power from the system.

DC System Power-Down Procedure

To power down the DC system, proceed as follows:

1. Power down all inserted and active blades using a system management software.
2. Toggle both PEM breakers to the OFF position.
3. Verify that the LEDs of the PEMs are off.

4.4 AC Power Supply (PSU)

This section discusses the operations of the AC power supply for the AXP640.

4.4.1 Description

The AXP640 has two or four AC PSUs depending upon the system configuration. Two PSUs are used for Hi-line (220VAC) systems while four are used for low-line (110 VDC) systems. The AC PSUs plug directly into the front of the chassis and delivers power to the backplane. Each input is rated for 16 amps. The AC PSUs power six AdvancedTCA slots, SAMs, and FTMs.

Power is introduced to the AC PSU using one of 4 IEC AC power cables connected to the rear of the shelf. Each IEC connector is connected to a single PSU. The 48 VDC output is distributed from the PSUs in a redundant manner. The two power supply bays on the left form feed A, and the two on the left form feed B. In the low-line configuration with two supplies per feed, operate in a current share mode.

4.4.2 PSU Management

The PSUs do not contain IPMC blocks. They have discreet status that is reported through sensors through SAM-A (0xfe) and SAM-B (0xfc). Voltage and current information may be obtained through sensors instantiated on SAM-B (0xFC) only. The PSUs are managed by the Sentry Shelf Management software. For more information, refer *AXP640 Subsystem IPMI Programmer's Reference Guide*.

4.5 DC Power Entry Module (PEM)

This section discusses the operations of the DC Power Entry Module for the AXP640 configurations.

4.5.1 Description

The AXP640 has PICMG 3.0 compliant, dual DC PEMs and is rated for nominal -48VDC to -60VDC. The PEMs plug directly into an intermediate power board that delivers power to the main backplane, delivers power to the backplane. Each input is rated for 60 amps. The 60 amp feed powers six AdvancedTCA slots, SAMs, and FTMs.

⚠ WARNING

Removing power to these components cannot be accomplished by turning the PEM's circuit breakers to the OFF position. The PEMs remain powered until the -48VDC power to each terminal block on the rear of the chassis is removed. Make sure you disconnect the power at the external source before removing the PEM from the shelf.

Power is introduced to the PEM using a DC power cable attached to the terminal blocks on the rear of the chassis (power input cable and return cable). The terminal block consists of a dual stud connection which prevents the power cables from rotating and provides secure contacts for the cable lug. There is a plastic cover that protects the cable connections.

NOTICE

The DC power inputs must only be attached to approved Telephone Network Voltage (TNV) or Safety Extra Low Voltage (SELV) branch circuits. Branch circuits must comply with all requirements called for in these safety standards: IEC 60950, EN 60950, CAN/CSA-C22.2 No. 60950. Attaching inputs to non-TNV/SELV approved power sources will cause the system to fail compliance with safety regulations.

4.5.2 IPMC Circuitry

Each PEM is capable of monitoring voltage and circuit breaker status. The PEMs are loaded with the AdvancedTCA IPMC firmware. Preprogrammed FRU and Sensor Data Record (SDR) information reside on the PEM and is accessible from the SAM through the IPMB ports of the PEM. In addition, the IPMC monitoring functions include digital inputs to detect circuit breaker trips, voltage sensors to detect backplane voltages, current sensors to detect current to the backplane, and on-board circuitry to detect failures on the PEM. The PEMs are managed by the

Sentry Shelf Management software. Refer to the *AXP640 Subsystem IPMI Programmer's Reference* guide listed in Appendix A, *Related Documentation* for more information.

Table 4-1 PEM IPMB Addresses

Description	IPMB Address
PEM A	0x66
PEM B	0x68

4.6 Fan Tray Modules

This section discusses the operation of the Fan Tray Modules (FTMs) of the AXP640.

4.6.1 Description

The FTMs are loaded with AdvancedTCA IPMC firmware. The fans are controlled as a group through the IPMI-based interfaces (IPMB) to the SAM. The IPMI interface is used for reporting faults, events, and status.The shelf manager software performs management of the FTM through the IPMB bus.The IPMC circuit provides temperature sensors for monitoring the temperatures of the FTM board components and for monitoring the inlet and outlet air temperature of the shelf. For further information, refer to the *AXP640 Subsystem IPMI Programmer's Reference* guide listed in Appendix A, *Related Documentation*.

The FTMs have variable speed fan control, which is dependent on the temperature readings in the shelf. Airflow rates can vary depending on the fan speed and payload. Fan speed levels are controlled from the SAM through the IPM shelf management software. The fan speed levels change automatically based on temperature sensors. For more information, refer to *Fan Speed and Control* on page 173.

Each FTM is equipped with a single bi-colored status LED on the face plate. For removal and installation procedures for the FTMs, refer to Chapter 6, *FRU Installation*.

In the event of a FanOut-of-Service alarm, first check the fan filters to make sure the airflow is not obstructed. For information on the maintenance of air filters, see *Air Filter Maintenance* on page 110.

4.6.2 Cooling Budget

The shelf cooling is designed to operate with the following temperature rises across the shelf. This allows cards with these dissipations to operate with commercial grade components, 70°C ambient temperature typical.

Table 4-2 Cooling Budget

Ambient Temperature	Temperature Rise
25°C	Delta T = 20° C
40°C	Delta T = 15° C
55°C	Delta T = 10° C

The following guidelines can assist in determining the cause of the cooling failure. Also refer to *Environmental Requirements* on page 82 for important information regarding ambient temperature requirements during servicing.

If a cooling failure occurs, the failure may be caused by a failed fan or possibly a clogged filter. Check the filter first before replacing the FTM (see *Air Filter Maintenance* on page 110).

For further information of nonrecoverable temperature events, refer to the FRU Information chapter in the *AXP640 Subsystem IPMI Programmer's Reference*.

4.6.3 IPMC Circuitry

Preprogrammed FRU and SDR information reside on the FTMs and is accessible from the SAM through the IPMB. FRU information can be found in the *AXP640 Subsystem IPMI Programmer's Reference*, listed in Appendix A, *Related Documentation*.

4.7 Air Filter Maintenance

Air filters should be cleaned every 90 days or sooner, depending on the conditions of the Central Office Environment. Because Central Offices vary in physical location and cleanliness, check your air filters every week after you first install your system. In a dusty environment, a filter may need cleaning more often than a filter in a cleaner environment. Check the filters frequently until you have a good idea of how often it needs cleaning. Based on your findings, establish a regular cleaning schedule and keep a log to record the date of each filter cleaning or replacement.

Air filters should also be checked occasionally to make sure they are not obstructed or damaged. Visually inspect filters for tears or rips. Do not reinstall a torn filter as it will be ineffective in trapping particulates and will interrupt air flow distribution. To maintain safety certification, use only Artesyn approved fan filters. You can order replacement fan filters (part number RAF640) by contacting your Artesyn sales representative.

For replacement procedures, refer to *Replacing the Fan Filter* on page 162.

4.8 Cleaning the Air Filter

To ensure the AXP640 shelf operates properly, routine filter maintenance is required as discussed in *Air Filter Maintenance*. Maintenance includes cleaning, replacing, and properly storing the air filters.

Filter cleaning frequency depends on the environment the system is subjected to. The shelf filter requires routine cleaning to ensure effective filtration and airflow. To prevent air contamination from polluting the air filter and possibly obstructing the air intake of the system, the air filter should be replaced according to the schedule you have established based on your Central Office Environment as discussed in *Air Filter Maintenance*.

Remove and inspect the filter for tears or damage before cleaning it. If the filter is torn or damaged, discard the filter and replace it with a new one. Refer to *Replacing the Fan Filter* on page 162 if you need help.

If the filter is undamaged, proceed to clean it. There are several methods for cleaning the air filter.

1. Vacuum clean. A few passes of a vacuum cleaner can remove accumulated dust and dirt.

2. Oil-free compressor air. Point the compressed air nozzle in the opposite direction of the filter's operating airflow (blow from the filter's exhaust side toward the intake side).
3. Cold water rinse. Collected dirt is washed away using a standard hose nozzle with plain water. Ensure the filter is completely dry before returning to service.
4. Immersion in warm soapy water. Dip the filter in a solution of warm water and mild detergent. Then rinse the filter in clear water and let stand until completely dry before returning to service.

⚠ CAUTION

Before returning a filter to service, visually inspect it for tears or rips that may have occurred during cleaning. Do not reinstall a torn filter as it will be ineffective in trapping particulates and will interrupt air flow distribution. You may order replacement fan filters (part number RAF640) by contacting your Artesyn sales representative.

4.8.1 Storing the Filter

The ideal storage condition for the air filter is a cool, dry, dark environment. High temperature, humidity, and ultraviolet light adversely affect the filter media (foam). Foam also degrades when exposed to solvents and sulfates, such as engine exhaust.

Controlling relative humidity between 40%-80% and temperature between 4.4°C - 32.2°C (40°F - 90°F) yields an acceptable environment. Covering the filters with dark plastic keeps the foam dry and protects it from ultraviolet light. Purchase enough to keep adequate inventory for no more than a few months, filters could degrade under long term storage conditions.

AXP640 Shelf Installation

5.1 Overview

This chapter discusses mounting and installation options for the AXP640 shelf.

The topics covered are:

- *Installation Prerequisites*
- *Installing the Shelf*
- *AC Power Cable*
- *DC Power Cable*
- *Connecting the DC Cables to the AXP640*
- *Grounding the Shelf*
- *Powering Up the System*
- *Accessing the System*
- *Upgrading Firmware*

5.2 Shelf Physical Characteristics

The following table provides the dimensions and weight of an equipped and unequipped shelf and rack mounting requirements.

Table 5-1 AXP640 Shelf Physical Characteristics

Characteristics	Specifications
Size:	Height - 12.20 inches (31.0 cm) Width - 17.64 inches (44.8 cm) Depth - 19.42 inches (49.3 cm) without front cable tray Depth - 21.69 inches (55.1 cm) with front cable tray
Weight:	Refer to Table 3-5 on page 87.

Table 5-1 AXP640 Shelf Physical Characteristics (continued)

Characteristics	Specifications
Rack Mounting:	Per ETSI 600mm x 600mm ETSI frame on integrated front frame mounting ears. Frame mounting brackets are required for a 23" EIA frame. Rear mounting brackets are recommended in both instances for Central Office Environment. Each shelf requires 7U of space and effectively takes up 7U when mounted in a rack. Cable management trays are available for the front and the rear of the shelf.

5.3 Installation Prerequisites

This section describes the prerequisites required for installation.

5.3.1 Equipment You Will Need

You will need the following to install the AXP640 six-slot shelf into an approved EIA 23" or 600mm x 600mm ETSI frame:

- Torque wrench
- Nut driver with 7/16mm socket
- Multimeter
- Phillips head screwdriver, #1
- Front mounting brackets for an EIA 23" frame

5.3.2 Rack/Cabinet Cooling Guidelines

It is important to have sufficient open space at the front and rear of the shelf when installed in a rack or cabinet. Depending on whether the enclosure has solid or vented doors will determine the recommended open space required. Follow these guidelines for positioning the shelf to allow for the optimal open space for the shelf air inlet and shelf air exhaust.

Do not obstruct the ventilation openings at the top, sides and back of the shelf.

5.3.3 Mounting Options and Stabilization

The AXP640 is designed to be mounted in an equipment rack while maintaining conformance to the NEBS 24" deep lineup and the ETSI 600mm deep lineup standards for telecommunication equipment. For increased stability, we recommend that the rack is securely mounted to the floor, or if using stabilizing devices make sure they are installed and extended.

5.3.4 Weight Distribution Within a Rack

⚠ WARNING

To avoid personal injury or damage to the equipment, plan your installation so that (within the limitations of equipment and cabling):
The weight of the equipment is evenly distributed in the rack.
The heaviest units are mounted nearer the bottom of the rack.

Uneven mechanical loading of the rack may cause toppling.

5.3.5 Electrostatic Discharge (ESD) and Safety Procedures

Artesyn strongly recommends that you use an antistatic wrist strap and a conductive foam pad when installing or upgrading a shelf. Electronic components, such as disk drives, computer boards, and memory modules, can be extremely sensitive to electrostatic discharge (ESD). After removing the component from its protective wrapper or from the shelf, place the component flat on a grounded, static-free surface (and, in the case of a blade, component side up). Do not slide the component over any surface.

If an ESD station is not available, you can avoid damage resulting from ESD by wearing an antistatic wrist strap (available at electronics stores) that is attached to an active electrical ground. Note that a shelf may not be grounded if it is unplugged.

NOTICE

There is one earth ground located at the back of the shelf.
There are three ESD bonding points, two on the front and one on the back of the shelf.

5.4 Installing the Shelf

The AXP640 can be mounted in a 19" EIA, 23" EIA, or 600mm ETSI frame using front mounting brackets. Using rear mounting brackets is recommended for all frame types when installed in a Central Office Environment. Front or rear mounting brackets are not shipped with this product. For assistance with the acquisition or design of mounting brackets for your particular application, please contact your Artesyn representative.

⚠ WARNING

Do not mount a single shelf at the top of the rack. A top-heavy rack can tip, causing damage to equipment and injury to personnel.

⚠ WARNING

Do not use the FTM handles or PEM handles for lifting the shelf.
Make sure you have the appropriate equipment to safely lift and mount the shelf securely. To avoid personal injury or damage to the equipment, use two persons for the installation procedure.

5.4.1 19" and 23" EIA Rack/Cabinet

Installation

Front mounting brackets are required to attach the shelf to an EIA 19" and 23" frame.

1. Locate the standard mounting hole and slot locations on the front mounting flanges on the AXP640 shelf.
2. Fasten the mounting brackets to the back side of the front chassis flanges using M6 screws x 12mm at each of the four locations.
3. Be sure to mount the shelf with metal screws or bolts that give a good electrical connection between the screws or bolts and the mounting surface.
4. Tighten all screws using a torque setting of 35.5 to 38.5 inch-pounds.

NOTICE

Failure to observe proper grounding practices may cause a variety of noise, electrostatic discharge, and RFI (Radio Frequency Interference) problems.

5.4.2 600mm ETSI Rack/Cabinet

Installation

The shelf mounts directly from the integrated flange on the front of the shelf.

1. Locate the standard mounting hole and slot locations on the front integrated mounting flanges on the AXP640 shelf.
2. Fasten the mounting brackets to the back side of the front chassis flanges using M6 screws x 12mm at each of the four locations.
3. Be sure to mount the shelf with metal screws or bolts that give a good electrical connection between the screws or bolts and the mounting surface.

4. Tighten all screws using a torque setting of 35.5 to 38.5 inch-pounds.

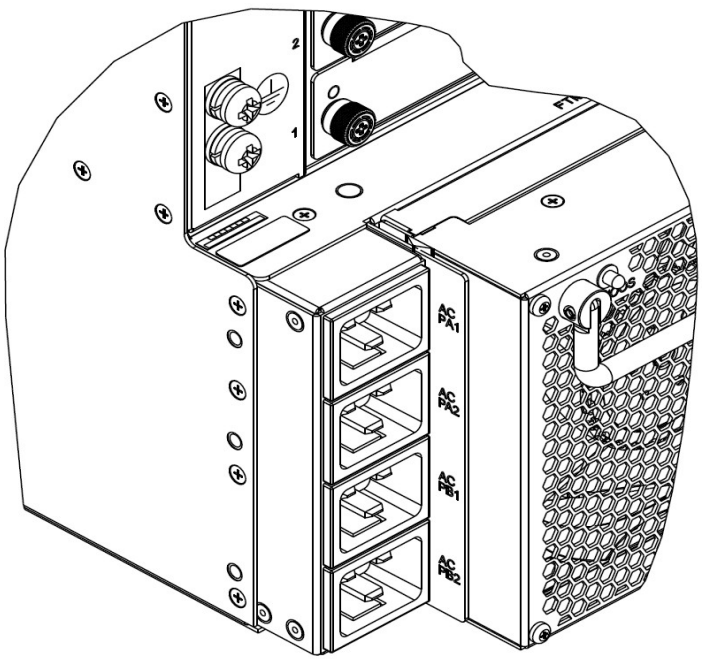
NOTICE

Failure to observe proper grounding practices may cause a variety of noise, electrostatic discharge, and RFI (Radio Frequency Interference) problems.

5.5 Grounding the Shelf

Use a 6 AWG wire with a 2-hole copper lug and connect directly to the earth ground point located on the right side of the back of the shelf; connect the other end of the wire to a reliable earth ground. Use the torque setting required by the connector supplier. The 2-hole lug prevents rotation of the lug and ensures a permanent bonding of ground to the shelf.

Figure 5-1 Placement of Grounding Lug



5.6 AC Power Cable

Power is introduced to the shelf at the AC inlet located in the rear of the shelf. The AC inlet contains IEC C-20 connectors to interface with C19 cable connectors.

NOTICE

Always check with your local building authorities for wire sizing requirements for your environment. The installation must comply with the 1993 National Electric Code (NEC) and other applicable codes. Branch circuits must comply with all requirements called for in these safety standards: IEC 60950, EN 60950, CAN/CSA-C22.2 No.60950.

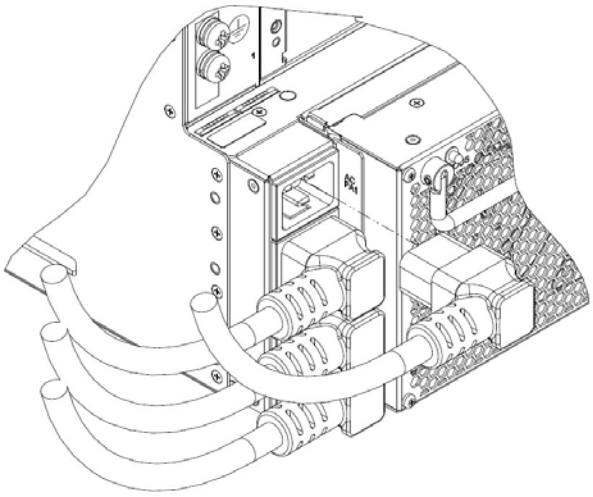
⚠ WARNING

Multiple power sources are present. Service only by qualified service personnel.

Mehrfache Energiequellen.

Handhabung nur durch geschultes Personal. Des sources multiples de pouvoir sont présentes. L'entretien de cet équipement doit être effectué par du personnel de service qualifié.

Figure 5-2 AC Power Cable Installation



5.7 DC Power Cable

Power is introduced to the shelf at the DC inlet located in the rear of the shelf. The recommended power cable is a 6 AWG gauge that meets the specifications for this shelf. There are two lugs for each DC feed.

NOTICE

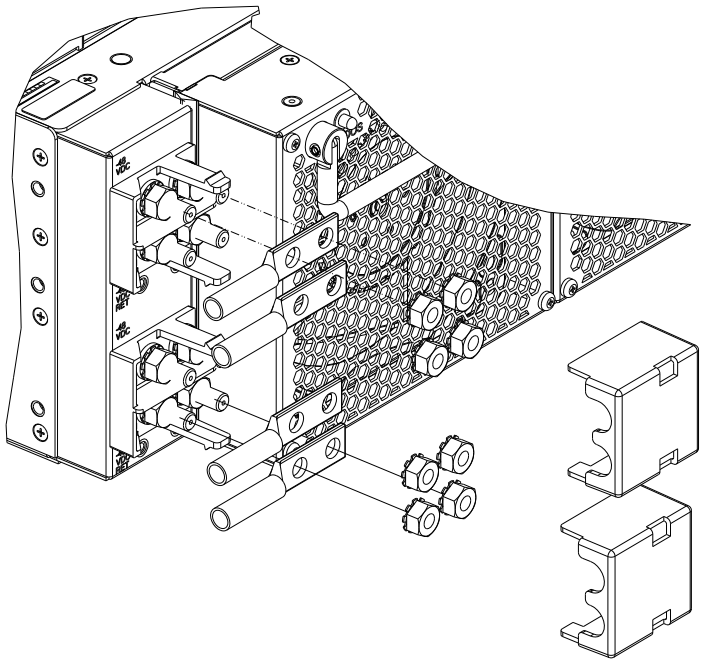
Always check with your local building authorities for wire sizing requirements for your environment.
The installation must comply with the 1993 National Electric Code (NEC) and other applicable codes.
The DC power inputs must only be attached to approved Telephone Network Voltage (TNV) or SELV (Safety Extra Low Voltage) branch circuits. Branch circuits must comply with all requirements called for in these safety standards: IEC 60950, EN 60950, CAN/CSA-C22.2 No. 60950. Attaching inputs to non-TNV/SELV approved power sources will cause the system to fail compliance with safety regulations.
The ground wire must be connected to a reliable earth ground connection to comply with Class 1 Equipment requirements.

⚠ WARNING

Multiple power sources are present.
Service only by qualified service personnel.
Mehrfache Energiequellen.
Handhabung nur durch geschultes Personal.
Des sources multiples de pouvoir sont présentes.
L'entretien de cet équipement doit être effectué par du personnel de service qualifié.

Wire	Signal
Earth Ground	PE GND (Primary Earth Ground)
Input power	-48VDC/-60VDC
Return	-48VDC/-60VDC RETURN

Figure 5-3 DC Power Connection Detail



5.8 DC Power Cable Termination

Use lugs that accommodate large gauge wires for up to 60 AMPs DC (6 AWG) when connecting to the PEM.

To minimize shorting of the terminals, the lugs must be insulated according to the following.

NOTICE

Heat shrink should be placed as close to the hole as possible (0.15") apart.

5.9 Connecting the DC Cables to the AXP640

In a redundant configuration, each PEM must be connected to a separate DC power source. Power is introduced to each PEM through the terminal blocks on the rear of the chassis (power input cable and return cable). The lugs provide secure contact for the cable and prevent the power cables from rotating. A plastic housing covers the power feeds and returns. For more information, refer Figure "DC Power Connection Detail" on page 121.

⚠ CAUTION

To cable a DC system, read all cautions and warnings, properly ground the equipment by following the procedure in *Grounding the Shelf* on page 118, and follow these steps. This procedure assumes that the PEMs are pre-installed in the shelf.

Procedure

Have the following tools on hand before you begin these steps: standard Phillips screwdriver, nut driver, torque wrench, multimeter, and lugs.

1. Locate the target power input cable's terminals at the branch circuit or power distribution unit. Open the external circuit breakers that provide DC feed power to the chassis.
2. Lock and tagout the circuit breakers on the branch circuit or power distribution unit.

⚠ WARNING

Cables may or may not be preinstalled at the branch circuit or power distribution unit.
If the DC power cables are not connected to the branch circuit or power distribution unit, connect the power cables to the chassis before connecting the DC power cables to the external power source.
If the DC power cables are connected to the branch circuit or power distribution unit, a qualified service person must confirm that the power to the cables is terminated (off) before continuing the steps to attach the cables to the PEMs.
In either case, use a multimeter to check the PEM end of the terminals to confirm there is no power present.

3. Using the appropriate tool, carefully remove the plastic covering over the terminal blocks.
4. Confirm that there is no power to the chassis lug bolts. Using a multimeter, measure between the two lugs and then measure between the chassis ground and each lug. If the DC potential is 3.0VDC or less, then power is not present.
5. Attach the DC power cables (input and return) to the dual lug bolts on each chassis power feed.
6. Using a torque wrench, tighten the nuts with a recommended torque setting of 35.5 to 38.5 inch-pounds. Make sure all DC leads are fastened securely.
7. Replace the plastic cover over the terminal blocks.

8. Verify that the PEM circuit breakers are in the ON position.
9. Break the tagout or lockout seals on the branch circuit or power distribution unit.
10. Apply power by closing the branch circuit or power distribution unit.
    The OOS indicator LED will glow solid red and the other LEDs will go dark. The OOS will not go dark and the IS indicator LED will not illuminate until the external power circuit breakers are closed.
11. Verify that all FRU LEDs illuminate and the PEM's IS LED is green, and the OOS LED is dark.

5.10 Powering Up the System

With the installation cabled up, you are ready to apply power to the system.

⚠ WARNING

Cover all open module slots and put all approved filler panels in place before turning on power. This is necessary to properly cool the chassis and to avoid electrical shock and other possible hazards. Slot covers and panels must remain in place during system operation.

Procedure

Follow these steps to power up the system:

1. Push the PEM circuit breakers to the ON position.
2. Verify that all FRU LEDs illuminate and the PEM's In Service LED is green.

The system executes its normal start-up routine and is then ready to use.

5.11 Accessing the System

You can access your system using the SAM shelf manager. The SAM-1500 direct serial console connector (front of chassis) is an RJ45 connector on the SAM face plate. This connector is configured as DTE. Configure your console or terminal emulation software using the parameters: baud rate 9600, data bits 8, parity None, stop bits 1, flow control None. The system is shipped with a default password of root.

Matching cable (part number CABLE/RJ45/DSUB/6E) can be ordered by contacting your Artesyn sales representative. Refer to *RS-232 Serial Interface* on page 170 for pin assignments.

5.12 Upgrading Firmware

Upgrading firmware on the AXP640 shelf involves the following components:

- IPMC firmware on the three Fan Tray Modules (FTMs)
- IPMC firmware on the two DC Power Entry Modules (PEMs)
- Shelf Manager firmware (including an FPGA image) on the two SAMs

5.12.1 FTM IPMC Firmware Upgrade

There is a single IPMC firmware image common to the three FTMs in the AXP640. The FTM IPMCs are assigned IPMB addresses 0x50, 0x52, and 0x54.

Different upgrade image variants are generated as part of the release, but only one file is required for the normal field upgrade process. This file is `axp640_fantray-upgrade-x_xx_xxx.hex`. As upgrades are released, Artesyn will supply the current version of this file.

NOTICE

The upgrade process described here uses a script named ipmcUpgrade.sh, which is supplied on shelf managers starting with build 5.3.1.-1.

Upgrade Process Steps

Follow these steps to upgrade the FTM firmware:

1. Copy the **axp640_fantray-upgrade-x_xx_xxx.hex** file to the **/tmp** directory on the active Shelf Manager.

NOTICE

The /tmp directory on the shelf manager is mounted to ram; this copy of the file will be deleted on the next reset of the shelf manager. If you want to save the file to flash, copy it to the /var/nvdata directories on both shelf managers.

Fan Tray hardware has two components to be upgraded. One is IMC and the other is ISC. These components can be upgraded individually using the target option as 1 or 2. However, upgrading IMC automatically upgrades ISC firmware but upgrading the ISC firmware does not upgrade the IMC.

Executing ipmcUpgrade script stops the shelf manager daemon.

2. Execute the following command to upgrade FTM3:
   ipmcUpgrade.sh 54 1 axp640_fantray-upgrade-x_xx_xxx.hex
3. After a successful upgrade, the **ipmcUpgrade** script displays the current firmware level reported by the device as shown in *FTM Upgrade Sample Output* on page 126.

5.12.1.1 FTM Upgrade Sample Output

The sample output for these commands for one FTM is shown below.

```
# ipmcUpgrade.sh 54 1 axp640_fantray-upgrade-1_04_006.hex

------------ SCRIPT REVISION -----------

REVISION                                ..... 1.01 $

----------- SCRIPT PARAMETERS ----------

IPMI ADDRESS                            ..... 0x54
```

```
UPGRADE TARGET                          ..... IPMC (IMC ONLY)

FW IMAGE                                ..... axp640_fantray-upgrade-
1_04_006.hex(EXISTS)

--------------- SHM CHECK --------------


*********************************************************

Shelf Manger on Other SAM640 MUST be Up and Running

*********************************************************


SHM STATUS                              ..... SHM Running (Backup)


Press enter to Stop Shelf Manger (CTRL-C to abort):


STOP SHM                                ..... .DONE, SHM IS DOWN

------------ FW IMAGE CHECK ------------

IMAGE FW VERSION                        ..... 01.04.006

FW IMAGE                               ..... EMERSON (FanTray IPMC, EMERSON
ATCA-BLOWER 644)

FIRST IMAGE                             ..... IMC {IMC FLASH}

SECOND IMAGE                            ..... NOT PRESENT


--------- CALLING UPGRADE TOOL -----------

  IPMC Firmware Upgrade Tool Version 1.0


DEBUG PRINT MASK                        ..... 0x07
```

```
LOCAL IPMB0-A/B ENABLE STATUS           ..... GOOD
        IPMB-A status 1
        IPMB-B status 1
IPMC MODE                               ..... NORMAL
CHECK IPMC STATUS
        IPMC 54(IMC)                    ..... PRESENT
        IPMC 54(ISC)                    ..... PRESENT
IMC IPMBAddr 54, ISC IPMBAddr 54


IPMC TO UPGRADE                         ..... EMERSON FAN TRAY


---------- IPMC FW REVISION ------------
IMC PRESENT, Firmware Version           ..... 01.04.005
ISC PRESENT, Firmware Version           ..... 01.04.005
HOT SWAP STATE                          ..... M4


IMC UPGRADE IN IPMC(USING ISCAddr 54)   ..... POSSIBLE


------------- IPMC UPGRADE -------------


Press Enter to Upgrade IMC of IPMC (CTRL-C to abort):
UPGRADING IMC OF IPMC ( ISCAddr 54 )    ..... STARTED
CHECK IPMB SENSOR                       ..... INITIAL UPDATE DONE
SET IPMB STATE - IPMC 54:
```

```
        IPMB A DISABLE

        IPMB B ENABLE

DISABLE IPMB0-A                          ..... DONE

++++++++++++++++++++++++++++++++++++++++

TIME FOR FLASHING                        ..... 28 s

IMC UPGRADE                              ..... DONE

WATING FOR AUTOMATIC ISC UPGRADE

++++++++

GET IMC STATUS

*AFTER UPGRADE IMC AT 54                ..... PRESENT


---- AFTER UPGRADE IPMC FW REVISION ----

IMC PRESENT, Firmware Version            ..... 01.04.006

ISC PRESENT, Firmware Version            ..... 01.04.006
```

5.12.2 PEM IPMC Firmware Upgrade

There is a single IPMC firmware image common to the two PEMs in the AXP640. The PEM IPMCs are assigned IPMB addresses 0x66 and 0x68.

The file containing the firmware image is `AXP640_DCPEM-upgrade-x_xx_xxx.hex`. As upgrades are released, Artesyn will supply the current version of this file.

Upgrade Process Steps

Follow these steps to upgrade the PEM firmware:

1. Copy the `AXP640_DCPEM-upgrade-x_xx_xxx.hex` file to the `/tmp` directory on the active Shelf Manager.

NOTICE

The /tmp directory on the shelf manager is mounted to ram; this copy of the file will be deleted on the next reset of the shelf manager. If you want to save the file to flash, copy it to the /var/nvdata directories on both shelf managers.

2. Execute the following command to upgrade one PEM:
   ```
   # ipmcUpgrade.sh 66 AXP640_DCPEM-upgrade-x_xx_xxx.hex
   reboot=n
   ```
3. After a successful upgrade, the `ipmcUpgrade` script displays the current firmware level reported by the device as shown in *PEM Upgrade Sample Output* on page 130.

5.12.2.1 PEM Upgrade Sample Output

The sample output for this command for one PEM is shown below.

```
# ipmcUpgrade.sh 66 AXP640_DCPEM-upgrade-1_04_008.hex  reboot=n

------------ SCRIPT REVISION -----------

REVISION                                ..... 1.03 $

----------- SCRIPT PARAMETERS ----------

IPMI ADDRESS                            ..... 0x66

UPGRADE TARGET                          ..... IPMC (IMC)

FW IMAGE                                ..... AXP640_DCPEM-upgrade-
1_04_008.hex(EXISTS)

-------------- SHM CHECK --------------
```

```
**********************************************************

Shelf Manger on Other SAM640 MUST be Up and Running

**********************************************************


SHM STATUS                                ..... SHM Running (Backup)


Press enter to Stop Shelf Manger (CTRL-C to abort):


STOP SHM                                  ..... .DONE, SHM IS DOWN

------------ FW IMAGE CHECK ------------

IMAGE FW VERSION                          ..... 01.04.008

FW IMAGE                                  ..... EMERSON (PEM IPMC, EMERSON
POWER ENTRY MODULE 644P)

FIRST IMAGE                               ..... IMC {IMC FLASH}

SECOND IMAGE                              ..... NOT PRESENT

--------- CALLING UPGRADE TOOL -----------

IPMC Firmware Upgrade Tool Version 1.0

DEBUG PRINT MASK                          ..... 0x07

LOCAL IPMB0-A/B ENABLE STATUS             ..... GOOD

        IPMB-A status 1

        IPMB-B status 1

IPMC MODE                                 ..... NORMAL

CHECK IPMC STATUS

        IPMC 66(IMC)                      ..... PRESENT

        IPMC 66(ISC)                      ..... PRESENT

IMC IPMBAddr 66, ISC IPMBAddr 66
```

```
IPMC TO UPGRADE                          ..... EMERSON POWER ENTRY MODULE
---------- IPMC FW REVISION ------------
IMC PRESENT, Firmware Version            ..... 01.04.006
ISC PRESENT, Firmware Version            ..... 01.04.006
HOT SWAP STATE                           ..... M4
IMC UPGRADE IN IPMC(USING ISCAddr 66)    ..... POSSIBLE
------------- IPMC UPGRADE -------------
Press Enter to Upgrade IMC of IPMC (CTRL-C to abort):
UPGRADING IMC OF IPMC ( ISCAddr 66 )     ..... STARTED
CHECK IPMB SENSOR                        ..... INITIAL UPDATE DONE
SET IPMB STATE - IPMC 66:
        IPMB A DISABLE
        IPMB B ENABLE
DISABLE IPMB0-A                          ..... DONE
++++++++++++++++++++++++++++++++++++++++
TIME FOR FLASHING                        ..... 28 s
IMC UPGRADE                              ..... DONE
WATING FOR AUTOMATIC ISC UPGRADE
++++++++
GET IMC STATUS
*AFTER UPGRADE IMC AT 66                ..... PRESENT
---- AFTER UPGRADE IPMC FW REVISION ----
IMC PRESENT, Firmware Version            ..... 01.04.008
ISC PRESENT, Firmware Version            ..... 01.04.008
#
```

5.12.3 Shelf Manager Firmware Upgrade

There are three files which contain the ShM firmware: `sentry.shmm1500.kernel`, `sentry.shmm1500.rfs`, and `sentry.shmm1500.u-boot.bin`. All files should be loaded onto both ShMs using the procedures described here.

As upgrades are released, Artesyn will supply the current version of these files.

Shelf Manager Upgrade Steps

The upgrade process involves the following steps.

1. Preserving and restoring configuration settings
   Normally, any configuration settings you have saved in `/etc/shelfman.conf` and `/etc/shelfman.conf.sam1500` are preserved during the upgrade procedure (if you are starting with a version of shelfman that is at revision PPS 2.5.2 or higher), so you do not need to save and restore unique settings saved in these files. Occasionally, however, a firmware upgrade presents a change in the options presented in these configuration files. If this is the case, you are asked to note any changes to settings you have made to these files, and to perform the upgrade in a way that overwrites these configuration files. You then need to edit these text files, reapplying your changes.

NOTICE

If you are starting from an earlier version of shelf man (prior to PPS 2.5.2), your configuration files will not be preserved across an upgrade, and you will need to restore any special configuration settings by editing the **`.conf`** files after the upgrade

2. Upgrading the U-boot, kernel, and root file system images
   This is the normal upgrade sequence.

3. Updating the default U-boot environment variable configuration
   The upgrade procedure preserves all U-boot environment variables. No special procedures are necessary.

Start the following sequence of operations with the backup Shelf Manager.

5.12.3.1 Establishing Network Connectivity to the SAM

The list below outlines the different actions required to enable and use the front panel Ethernet interface on a SAM. If the upgrade is being performed over the backplane Ethernet interfaces from one of the hub boards, skip these steps.

1. Login to the SAM front panel serial console using the id **`root`** and password **`root`**.
2. Set the environment variable that defines the IP address allocated for the SAM's front panel Ethernet interface.
   `# setenv ip1addr W.X.Y.Z` (substituting your address)
   `# ifconfig eth1 W.X.Y.Z`
3. If your file server (for Artesyn files) is on a different subnet, :
   `# route add default gw W.X.Y.Z` (you will need to do this each time you reboot)
   If you use the Uboot environment variable gatewayip, the route is set automatically at reboot (setenv gatewayip W.X.Y.X)
4. If the local subnet is not a class 'C' subnet, you may need to also execute the command:
   `# ifconfig eth1 netmask ...` to alter the netmask used by the ethernet interface
   If you use the Uboot environment variable netmask1, this subnet mask is set automatically at bootup (setenv netmask1 netmask)
5. Ping the file server containing the Artesyn files. You should get a response if the Ethernet cable is connected.
6. Set the environment variable that keeps the front panel Ethernet interface enabled following a reboot.
   `# setenv enable_front_panel_ethernet y`

5.12.3.2 Update ShM Firmware on the SAM

This step involves programming of the U-boot, Linux kernel, and root file system into flash on the ShMM1500 on the SAM.

1. Copy the three required firmware image files listed below to the **`/tmp`** directory on the ShM:
   - sentry.shmm1500.u-boot.bin
   - sentry.shmm1500.kernel
   - sentry.shmm1500.rts
     One way of doing this is:

scp acctname@fileserver_ip:dirname/sentry.shmm1500.* /tmp
where:
acctname is the login account for the user on the (linux) file server
fileserver_ip is the IP address of the file server
dirname is the relative directory name (from the login home) for the location of the images
Verify that the files were copied to **`/tmp`**.

2. Execute the command to program these images into flash and then reset to execute the new images:
   # rupgrade_tool -s -v -d -a [--hook=erase]
   The "—-hook=erase" argument is optional, and is normally not used. This directs the upgrade procedure to avoid preserving the customer-specific configuration files, /etc/shelfman.conf and /etc/shelfman.conf.sam1500. Normally, these files should be preserved across an upgrade, but on occasion, when Artesyn makes a change to the format of the configuration options, you may be instructed to use this option. In this case, you need to re-enter the configuration by editing these files, following the upgrade.
3. The files are copied to flash memory and the system should reboot in a couple of minutes. When the system is restarted, the bootup logic automatically determines if the SAM1500 FPGA needs to be loaded to a new firmware revision. If so, an additional upgrade and reboot takes place and takes an additional 5-8 minutes. The SAM should now be running the new firmware.

The process can now be repeated with the other Shelf Manager.

6.1 Overview

The following chapters help you to start up and maintain the system:

Step	Description
Installing RTMs, blades, and SAMs	This section provides information about how to install and remove RTMs, AdvancedTCA blades, and shelf management alarm modules.
Covering unused slots	This section provides information how to cover empty slots.
Installing power components	This section provides information about how to install and remove Power Entry Modules.
Installing fan trays	This section provides information about how to install and remove upper and lower fan trays.
Installing an air filter	This section provides information about how to install and remove an air filter.
Installing cable management	This section provides information about to install the cables of the system securely.

6.2 Installing RTMs, Blades and SAMs

The following sections provide the information needed to install RTMs, AdvancedTCA blades, and SAMs.

NOTICE

Installation Sequence of RTMs and AdvancedTCA Blades
If you are going to install an RTM and an AdvancedTCA blade, you have to regard the following sequence:
First install the RTM, then install the matching AdvancedTCA blade. Otherwise the blades and RTMs will be damaged.

6.2.1 Module Installation and Removal

The RTM can be installed into a powered or nonpowered system.

NOTICE

RTM Damage
Installing the RTM with other blades than the ones designed for it may damage the RTM and the front blade.
Only install the RTM with the correct front blade.

Damage of Circuits
Electrostatic discharge and incorrect RTM installation and removal can damage circuits or shorten their life.
Before touching the RTM or electronic components, make sure that you are working in an ESD-safe environment.

6.2.1.1 Installing the RTM

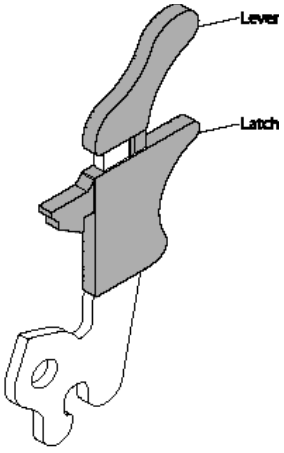
You can install the RTM into a system if the front blade is already installed or if it is not installed. If the front blade is already installed, its payload has to be powered down first.

Installation Procedure with Installed Front Blade

The following procedure describes the installation of the RTM. It assumes that your system is powered. If your system is unpowered, you can disregard the blue LED and thus skip the respective step. In this case it is a purely mechanical installation.

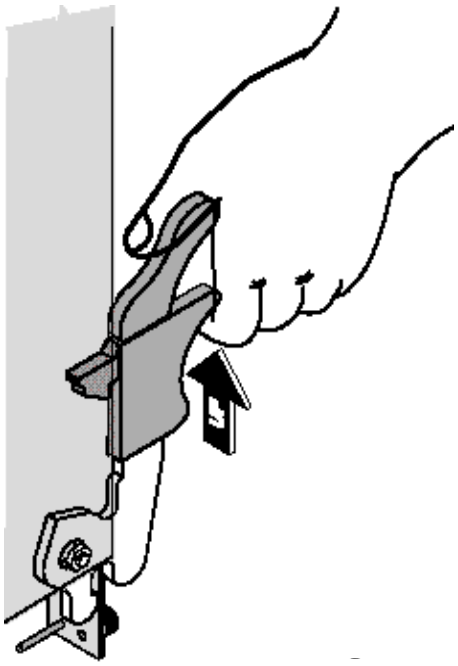
1. Locate the slot the RTM is to be installed into the shelf's rear which must be the same as that of the front blade.
2. Open the lower handle of the front blade in order to power down its payload.
   The blue LED on the front blade starts to flash. This indicates that the front blade is informing the shelf manager about its desire to power down its payload.
3. Wait until the blue LED on the front blade is ON.
   This indicates that the front blade's payload is powered down.

4. Ensure that the top and the bottom handles of the RTM are in an outward position by squeezing the lever and the latch together.



5. Insert the RTM into the shelf by placing the top and bottom edges in the card guides of the slot.
6. Slide the RTM into the slot.
7. Apply equal and steady pressure to the RTM to carefully slide the RTM into the shelf until you feel resistance. Continue to gently push the RTM until the RTM connectors engage.
8. Squeeze the lever and the latch together and hook the lower and the upper handle into the shelf rail recesses.

9. Fully insert the RTM and lock it to the shelf by pressing the two components of the lower and the upper handles together and turning the handles toward the face plate.



If your shelf is powered, as soon as the RTM is connected to the front blade, the blue LED is illuminated, and will remain illuminated until both the lower handle of the RTM and the lower handle of the front blade are closed.

10. Close the lower handle of the front blade in order to power up the payload of both the front blade and the RTM.
The blue LEDs of both the front blade and the RTM start to flash. This indicates that the front blade is informing the shelf manager about its desire to power up the payload of both the front blade and the RTM.

11. Tighten both face plate screws on the RTM.

12. Wait until the blue LEDs of both the front blade and the RTM are OFF.

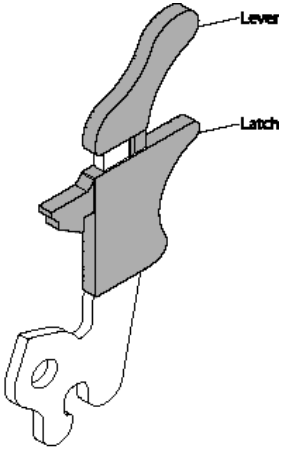
A switched OFF blue LED indicates that the payload of the respective blade or RTM has been powered up and is active.

13. Plug interface cable into face plate connectors, if applicable.

Installation Procedure without Installed Front Blade

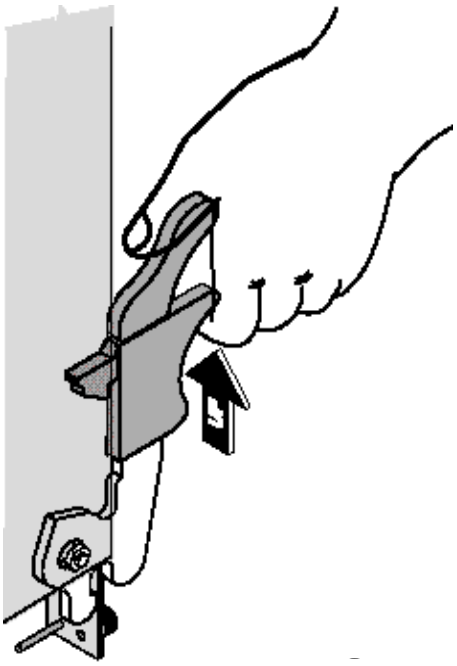
The following procedure describes the installation of the RTM.

1. Locate the slot the RTM is to be installed into the shelf's rear which must be the same as that of the front blade.
2. Ensure that the top and the bottom handles of the RTM are in an outward position by squeezing the lever and the latch together.



3. Insert the RTM into the shelf by placing the top and bottom edges in the card guides of the slot.
4. Slide the RTM into the slot.
5. Apply equal and steady pressure to the RTM to carefully slide the RTM into the shelf until you feel resistance. Continue to gently push the RTM until the RTM connectors engage.
6. Squeeze the lever and the latch together and hook the lower and the upper handle into the shelf rail recesses.

7. Fully insert the RTM and lock it to the shelf by pressing the two components of the lower and the upper handles together and turning the handles toward the face plate.



8. Tighten both face plate screws on the RTM.
9. Insert the front blade from the system's front into the same slot as the RTM.
   As soon as the front blade is connected to the backplane, the blue hot swap LEDs of both the front blade and the RTM are illuminated permanently. This indicates that the IPMC of the front blade and the MMC of the RTM are powered up.
10. Close the handles of the front blade.
    The blue LEDs on both the front blade and the RTM start flashing. This indicates that the front blade is informing the shelf manager about its desire to power up the payload of both the front blade and the RTM.
11. Tighten the two face plate screws on the front blade.
12. Wait until the blue LEDs on both the front blade and the RTM are OFF.

Switched off blue LEDs indicate that the payload of the respective blade or RTM has become active.

13. Plug interface cable into face plate connectors, if applicable.

6.2.1.2 Removing the RTM

Removal Procedure

The following procedure describes the removal of the RTM. It assumes that your system is powered. If your system is unpowered, you can disregard the blue LED and thus skip the respective step. In this case it is a purely mechanical procedure.

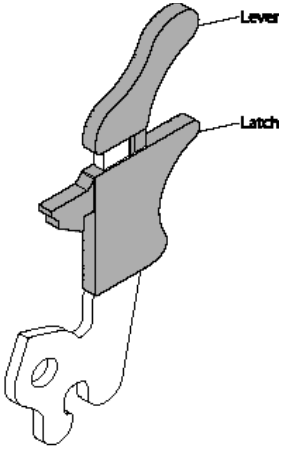
NOTICE

Damage of RTM and Front Blade
Removing the RTM from the system while the payload of the front blade is powered up may damage the front blade and RTM.
Whenever removing the RTM from the system, you have to power down the payload of the front blade first.

1. Unlatch the lower handle outward by squeezing the lever and the latch together and turning the handle outward only enough to unlatch the handle from the face plate, that means until you feel a resistance. Do not rotate the handle fully outwards.
   The blue LED blinks indicating that the shelf manager is informed about the desire of the blade to power down the payload of both the front blade and the RTM and the power-down process is ongoing.

NOTICE

Data Loss
Removing the RTM with the system power on and the blue LED on the front blade still flashing causes data loss.
Before removing the RTM from a powered system, power down the slot by opening the lower handle of the front blade and wait until the blue LED is permanently ON.



2. Wait until the blue LEDs on both the front blade and the RTM are permanently ON. A permanently switched ON LED indicates that the payload of respective blade or RTM has been powered down.
3. Unlatch the upper handle and rotate both handles fully outward.

4. Remove interface cables from face plate connectors, if applicable.
5. Loosen the two RTM face plate screws.
6. Remove the RTM from the slot.

6.2.2 Node Blade Installation and Removal

The blade is fully compatible to the AdvancedTCA standard and is designed to be used in AdvancedTCA shelves. The blade can be installed in any AdvancedTCA node slot.

NOTICE

Damage of Circuits
Electrostatic discharge and incorrect blade installation and removal can damage circuits or shorten their life.
Before touching the blade or electronic components, make sure that you are working in an ESD-safe environment.

Blade Malfunctioning
Incorrect blade installation and removal can result in blade malfunctioning.
When plugging the blade in or removing it, do not press on the face plate but use the handles.

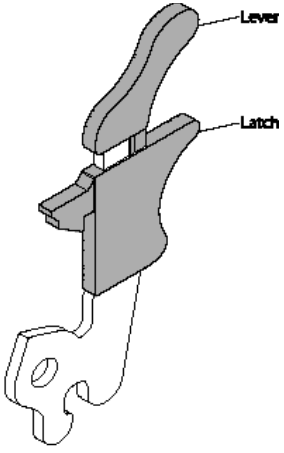
6.2.2.1 Installing the Node Blade

To install the blade into an AdvancedTCA shelf, proceed as follows.

Installation Procedure

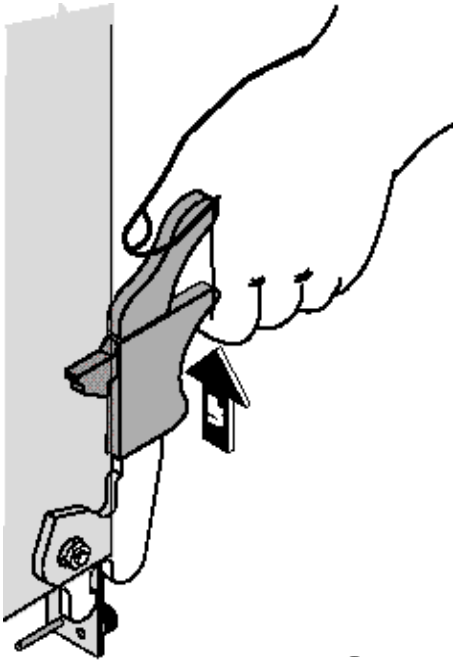
The following procedure describes the installation of the blade. It assumes that your system is powered. If your system is unpowered, you can disregard the blue LED and thus skip the respective step. In this case it is a purely mechanical installation.

1. Ensure that the top and bottom ejector handles are in the outward position by squeezing the lever and the latch together.



2. Insert blade into the shelf by placing the top and bottom edges of the blade in the card guides of the shelf. Ensure that the guiding module of shelf and blade are aligned properly.
3. Apply equal and steady pressure to the blade to carefully slide the blade into the shelf until you feel resistance. Continue to gently push the blade until the blade connectors engage.
4. Squeeze the lever and the latch together and hook the lower and the upper handle into the shelf rail recesses.

5. Fully insert the blade and lock it to the shelf by squeezing the lever and the latch together and turning the handles towards the face plate.



If your shelf is powered, as soon as the blade is connected to the backplane power pins, the blue LED is illuminated.
When the blade is completely installed, the blue LED starts to blink. This indicates that the blade announces its presence to the shelf management controller.

If an RTM is connected to the front blade, make sure that the handles of both the RTM and the front blade are closed in order to power up the blade`s payload.

6. Wait until the blue LED is switched off, then tighten the face plate screws which secure the blade to the shelf.

The switched off blue LED indicates that the blade`s payload has been powered up and that the blade is active.

7. Connect cables to the face plate, if applicable.

After the blade has been inserted, you have to ensure that a boot image is either present on the Artesyn switch or on the blade's hard disk.

6.2.2.2 Removing the Node Blade

This section describes how to remove the blade from an AdvancedTCA system.

NOTICE

Damage of Circuits
Electrostatic discharge and incorrect blade installation and removal can damage circuits or shorten their life.
Before touching the blade or electronic components, make sure that you are working in an ESD-safe environment.

Blade Malfunctioning
Incorrect blade installation and removal can result in blade malfunctioning.
When plugging the blade in or removing it, do not press on the face plate but use the handles.

Removal Procedure

The following procedure describes how to remove the blade from a system. It assumes that the system is powered. If the system is unpowered, you can disregards the blue LED and thus skip the respective step. In that case it is a purely mechanical procedure.

1. Unlatch the lower handle by squeezing the lever and the latch together and turning the handle outward only enough to unlatch the handle from the face plate. Do not rotate the handle fully outward.
   The blue LED blinks indicating that the blade power-down process is ongoing.

2. Wait until the blue LED is illuminated permanently, then unlatch the upper handle and rotate both handles fully outward.

If the LED continues to blink, a possible reason may be that upper layer software rejects the blade extraction request.

NOTICE

Data Loss
Removing the blade with the blue LED still blinking causes data loss.
Wait until the blue LED is permanently illuminated, before removing the blade.

3. Remove face plate cables, if applicable.
4. Unfasten the screws of face plate until the blade is detached from shelf.
5. Remove the blade from the shelf.

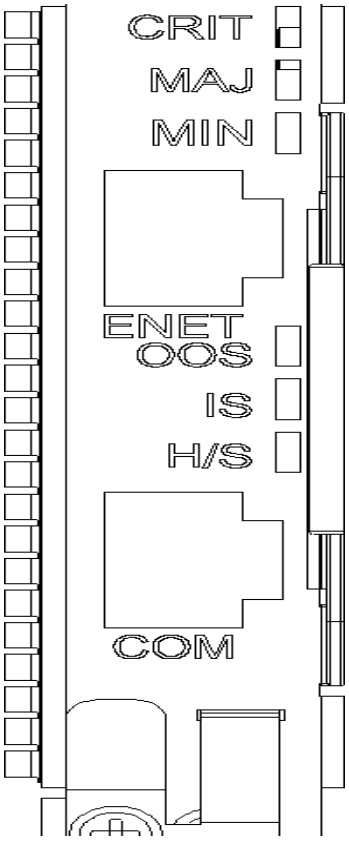
6.2.3 Installing and Removing the Shelf Management Alarm Module

The following sections describe the installation and removal procedures for the shelf management alarm module (SAM 640).

For a detailed description of the SAM, refer to Chapter 7, *Shelf Management Alarm Module,* on page 165.

The following figure shows the face plate of the SAM 640 shelf management alarm module.

Figure 6-1 SAM 640



NOTICE

Damage of Circuits
Electrostatic discharge and incorrect blade installation and removal can damage circuits or shorten their life.
Before touching the blade or electronic components, make sure that you are working in an ESD-safe environment.

6.2.3.1 Non-Powered System

This section describes the installation procedure for the SAM in non-powered systems.

Installation Procedure

To install a SAM in a non-powered shelf, proceed as follows:

1. Put on an ESD wrist strap.
2. Connect the strap to the shelf by attaching the front ESD jack.
3. Insert the module into the shelf by placing the top and bottom edges of the module in the card guides of the shelf. The alignment feature facilitates the insertion and prevents bent pins.
4. Fully insert the module into the shelf.
5. Screw in the captive screw.

Removal Procedure

To remove a SAM from a non-powered shelf, proceed as follows:

1. Put on an ESD wrist strap.
2. Connect the strap to the shelf by attaching the front ESD jack.
3. Unfasten the captive screw at the lower edge of the face plate.
4. Grasp the handle on the module faceplate and remove the module from the shelf. Apply steady pressure but do not force the module. If the SAM does not move, it means the captive screw is not fully unscrewed. Unscrew until loose, and proceed to remove the SAM.

6.2.3.2 Powered System

This section describes the installation and removal procedures for a SAM in powered systems.

Installation Procedure

To install a SAM in a powered shelf, proceed as follows:

1. Put on an ESD wrist strap.
2. Connect the strap to the shelf by attaching the front ESD jack.
3. Insert the module into the shelf by placing the top and bottom edges of the board in the card guides of the shelf. The alignment feature facilitates the insertion and prevents bent pins.
4. Fully insert the module into the shelf.
5. Wait until the blue LED is illuminated.
6. Screw in the captive screw hand tight. The blue LED blinks.
7. Wait until the blue LED is switched OFF. The switched off blue LED indicates that the board is in service.

Removal Procedure

To remove a SAM from a powered shelf, proceed as follows:

1. Put on an ESD wrist strap.
2. Connect the strap to the shelf by attaching the front or rear ESD jack.
3. Unfasten the captive screw at the lower edge of the face plate.
4. The blue LED blinks indicating that the module power down process is ongoing.
5. Wait until the blue LED is illuminated permanently.

NOTICE

Data Loss
Removing the module with the blue LED still blinking causes data loss. Wait until the blue LED is permanently illuminated, before removing the module.

6. Grasp the handle on the module faceplate and remove the module from the shelf. Apply steady pressure but do not force the module. If the SAM does not move, it means the captive screw is not fully unscrewed. Unscrew until loose, and proceed to remove the SAM.

6.3 Unused Slots

All unused node or hub slots must be covered with filler blades. These filler blades ensure a consistent airflow per slot whether or not the neighboring slot contains an AdvancedTCA blade. There are filler blades sized for the front and for the RTM slots. When fillers are used, both the front and RTM filler must be in place. Filler blades are available from Artesyn Embedded Technologies.

All unused power bay slots should similarly be filled with slot fillers when not in use. Additional power bay slot fillers are available from Artesyn.

6.4 Installing Power Entry Modules

The AXP640 shelf supports two Power Entry Modules (PEMs). Since the shelf is equipped with a redundant power distribution system, the removal of a single PEM does not interrupt system operation. PEMs are accessible from the rear of the shelf. Each PEM has EMI gaskets on all sides of the module that provide EMI shielding.

The following instructions describe how to replace a power entry module. For further information on power entry modules, refer to *Power Entry Modules (PEMs)* on page 64.

6.4.1 Tool You Will Need

- Standard #2 Phillips-head screwdriver

6.4.2 Removing the PEM

When replacing a PEM, make sure you have a replacement PEM available. PEMs are accessible from the front of the shelf, and does not require removal of the shelf power wiring.

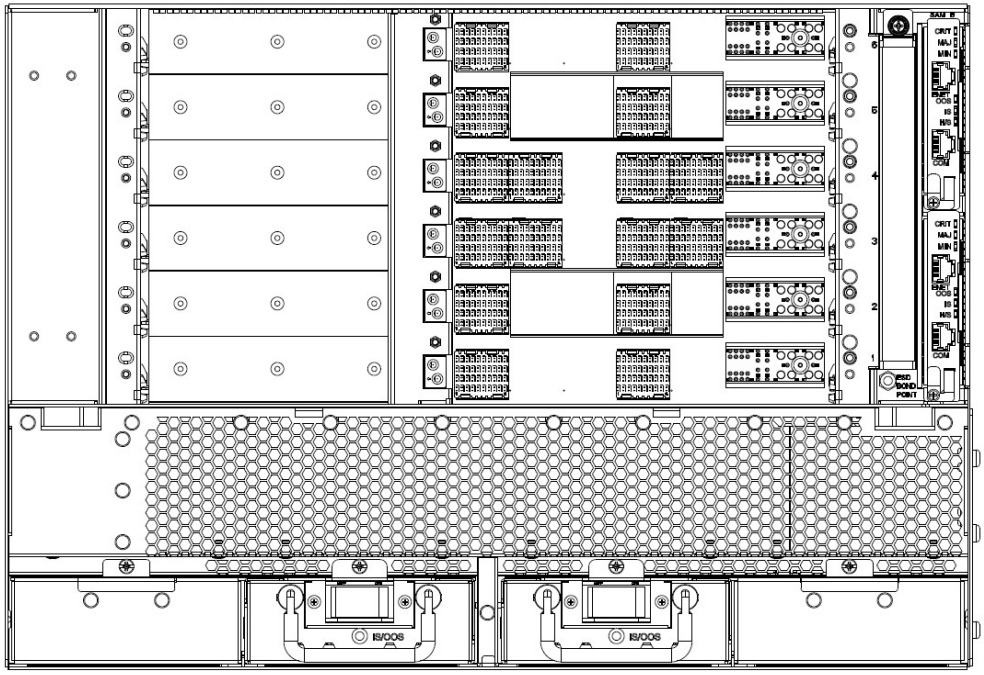
Replacing one PEM is done while the other PEM is in operation. Having the PEM located in the shelf is critical to maintaining proper airflow and cooling of the shelf. Steps in which a PEM is removed from a slot and reinserted should be completed within 3 minutes to maintain the shelf within safe operating temperatures.

⚠ CAUTION

Read all cautions and warnings, and ensure the equipment is properly grounded by reviewing the procedure in *Grounding the Shelf* on page 118, and follow these steps. The PEM has multiple power sources. This procedure should be followed precisely to ensure the PEM is isolated from all power sources before removing the PEM from the shelf.
This procedure assumes that the redundant PEMs are powered on in the shelf.

Removal Procedure

To remove a PEM, refer to this figure and follow the steps.



1. Remove the front bezel by squeezing the retention clasps incorporated into the top corners of the bezel, and rotating the top of the bezel away from the chassis.
2. Locate the target power input cable's terminals at the branch circuit or power distribution unit. Open the external circuit breakers that provide DC feed power to the PEM you are replacing.
3. Lock and tagout the circuit breakers on the branch circuit or power distribution unit.
4. Using the appropriate tool, loosen the chassis retention screw on the top of the PEM.
5. Open the circuit breaker on the PEM module being removed.

6. Open the ejector handle and gently pull on the PEM module. You will feel the PEM disconnect from the backplane.
7. Pull the module straight out from the rail guides, about 12 inches.

6.4.3 Installation Procedure

To install a power entry module, follow the steps below:

1. If not already removed, remove the front bezel by squeezing the retention clasps incorporated into the top corners of the bezel and rotating the top of the bezel away from the chassis.
2. Insure the replacement PEM circuit breaker is in the open position.
3. Align the PEM with the guide rails on the power bay that the PEM will be inserted into.

NOTICE

The DC PEMs will only engage a backplane connector in power bay A2 and B1 (PBA2 and PBA1) Power bay A1 and B2 (PBA1 and PBB2) are required to have power bay slot fillers installed.

4. Slide the module straight in on the guide rails, about 12 inches. You will feel the PEM engage the backplane connector.
5. Secure the PEM with the chassis retention screw at the top of the PEM module.
6. Rotate the PEM handle down so that it is flush with the front of the PEM module.
7. Close the PEM circuit breaker.
8. Remove the lock and tagout from the circuit breakers on the branch circuit or power distribution unit, and return power to the appropriate chassis power feed.

9. Verify that the PEM LED has changed from red to solid green. The PEM is now operational.
10. Reattach the bezel. To attach the bezel, place the bottom of the bezel on the mounting hooks on the bottom of the chassis. Rotate the top of the bezel towards the chassis until the bezel retention latches are secured into the chassis.

6.5 AC Power Supply Unit (PSU)

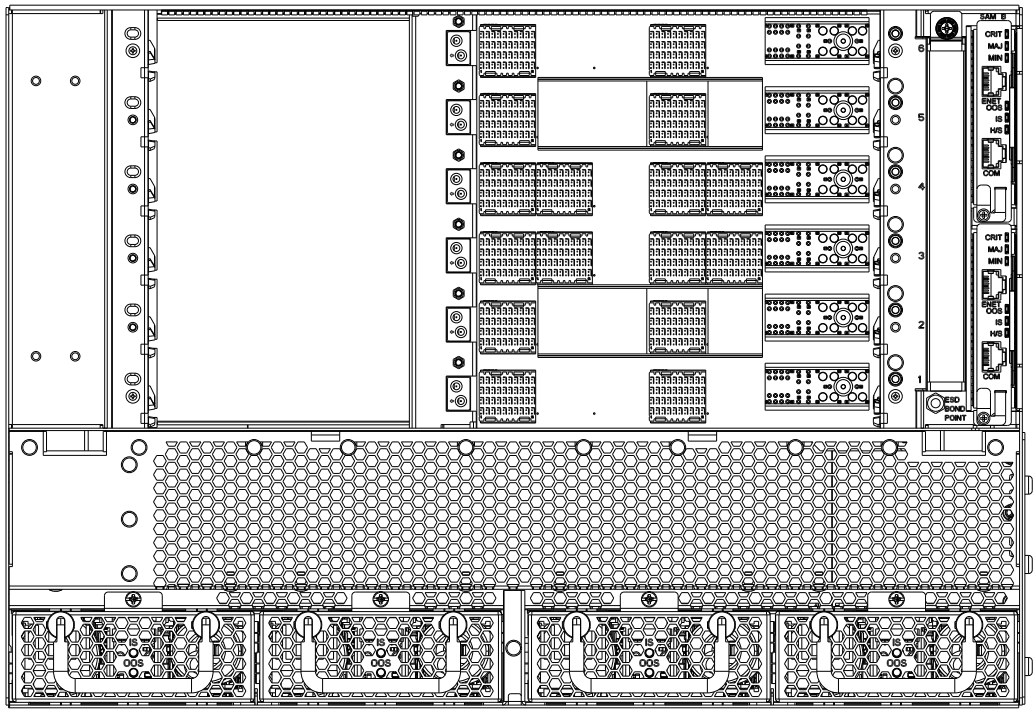
The following instructions describe how to remove and install an AC PSU.

6.5.1 AC PSU Removal Procedure

When replacing an AC PSU, make sure you have a replacement PSU available. AC PSUs are accessible from the front of the shelf, and do not require removal of the shelf power wiring.

To remove an AC PSU, refer to the following figure and follow these steps:

Figure 6-2 AXP640 PSU



1. If not already removed, remove the front bezel by squeezing the retention clasps incorporated into the top corners of the bezel and rotating the top of the bezel away from the chassis.
2. Using the appropriate tool, loosen the chassis retention screws on the top of the AC PSU module being serviced.
3. Open the ejector handle and gently pull on the PSU module being serviced. You will feel the PSU disconnect from the backplane.
4. Pull the module straight out from the rail guides, about 12 inches.

6.5.2 AC PSU Installation Procedure

1. If not already removed, remove the front bezel by squeezing the retention clasps incorporated into the top corners of the bezel and rotating the top of the bezel away from the chassis.
2. Align the AC PSU with the guide rails on the power bay that the PSU will be inserted into.
3. Slide the PSU module straight in on the guide rails, about 12 inches. You will feel the PSU engage the backplane connector.
4. Secure the PSU with the chassis retention screw at the top of the PSU module.
5. Rotate the AC PSU handle down so that it is flush with the front of the PSU module.
6. Verify that the AC PSU LED has changed to solid green. The PSU is now operational.
7. Reattach the bezel. To attach the bezel, place the bottom of the bezel on the mounting hooks on the bottom of the chassis. Rotate the top of the bezel towards the chassis until the bezel retention latches are secured into the chassis.

6.6 Fan Tray Modules

To prevent system damage, the operator must replace the fans within the recommended service interval shown in the following table to prevent a decline in shelf operability. Make sure the replacement FTM is available for exchange and ready to install.

Service Interval for 1 FTM	Temperature Range
Not recommended	40-55°C
Four hours	40°C maximum

When an FTM is taken out of operation, the system manager will compensate for the loss by increasing the speed of the remaining fans. Please read the following caution before replacing any of the FTMs.

⚠ CAUTION

Fans may continue to rotate after power is removed. Be careful to keep fingers away from the bottom of the FTM enclosure.

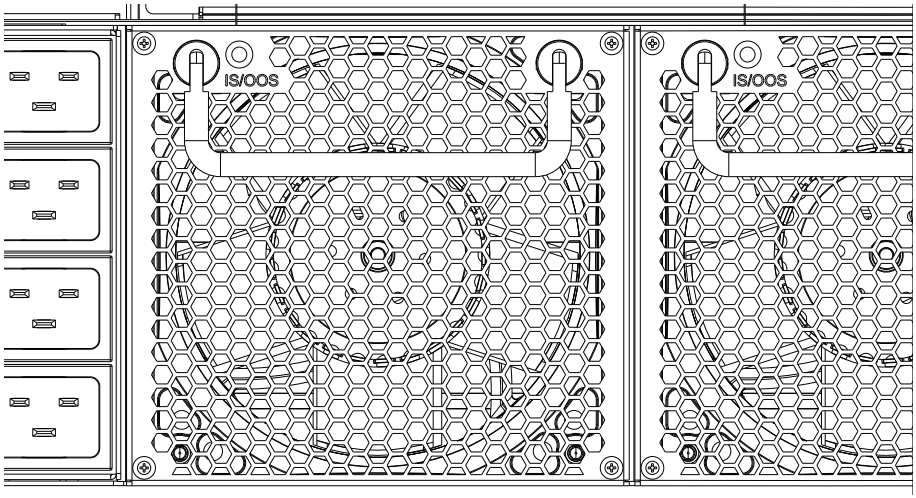
6.6.1 Removing an FTM

Removal Procedure

Follow these steps and refer to the figures to remove an FTM from the shelf.

1. Loosen the four chassis retention screws located at each corner of the module.

Figure 6-3 AXP640 FTM



2. Rotate the ejector handle to a fully open position.
3. Pull firmly but evenly to remove a FTM. You will feel the FTM disconnect from the backplane.

⚠ CAUTION

Keep fingers away from fan blades until fan has stopped rotating.

6.6.2 Installing an FTM

Installation Procedure

1. While supporting the FTM, align the FTM carefully into the fan guide rails in the shelf and slowly slide the FTM until the it is flush with the chassis.
2. Tighten the four chassis retention screws to secure the FTM. The recommended torque settings is 3.5 inch-pounds.
   When the red LED turns off and the green LED turns on, the fan is operating.

6.7 Replacing the Fan Filter

Your replacement fan filter consists of a filter media for the fan bezel, and a smaller media for the inlet region adjacent to the SAMs.

Air filters should be checked occasionally to make sure they are not obstructed or damaged. Visually inspect filters for tears or rips. Do not reinstall a torn filter as it will be ineffective in trapping particulates and will interrupt air flow distribution. To maintain safety certification, use only Artesyn approved fan filters. You can order replacement fan filters (part number RAF640) by contacting your Artesyn sales representative. For detailed information on filter maintenance and cleaning, see *Air Filter Maintenance* on page 110.

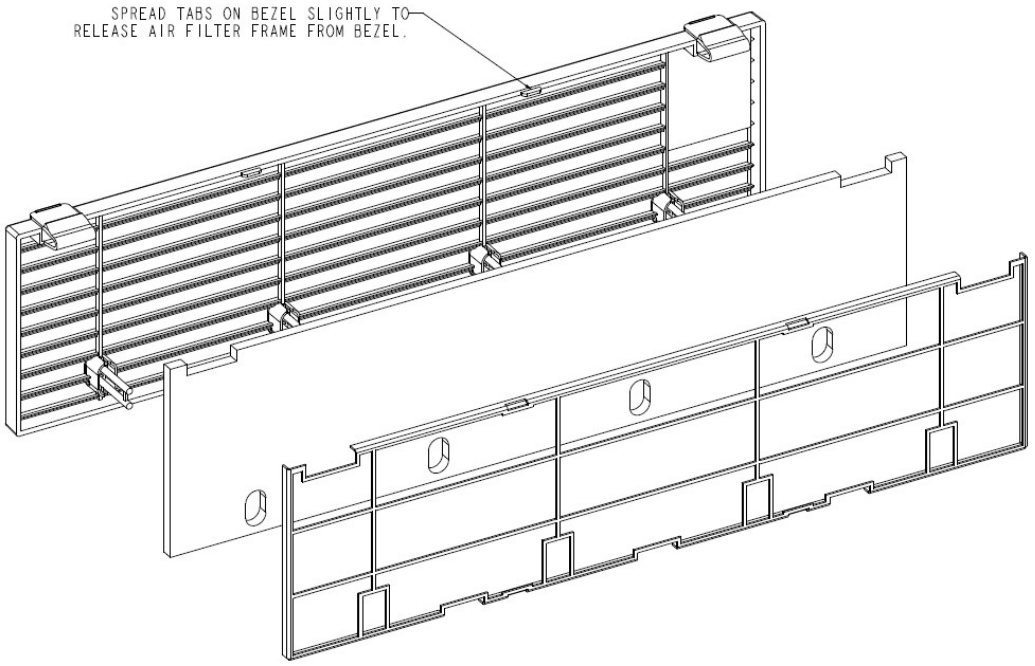
Replacement Procedure

To replace the fan filter, follow these steps. Please have your replacement fan filter available before starting this procedure.

Main Filter Replacement Procedure

1. Remove the front bezel by squeezing the retention clasps incorporated into the top corners of the bezel and rotating the top of the bezel away from the chassis.
2. Place the bezel face down so that the filter media and metal frame are facing up, and rotate the filter frame away from the housing.
3. Insert the replacement fan filter on the bezel by aligning the oval cutouts in the filter material with the light-pipe ovals.

Figure 6-4 Position of the Fan Filter



4. Replace the filter frame onto the bezel to secure the filter media.
5. Reattach the bezel by placing the bottom of the bezel on the mounting hooks on the bottom of the chassis. Rotate the top of the bezel towards the chassis until the bezel retention latches are secured into the chassis.

SAM Filter Replacement Procedure

1. Loosen thumbscrew to remove SAM air filter frame from the chassis.
2. Tilt the air filter frame down and remove it from the chassis.
3. The air filter element is held to the air filter frame by 2 pieces of Velcro on the backside of the frame. Pull the air filter element off the Velcro to remove it from the frame. Press the new air filter element firmly against the Velcro to reattach it to the frame.

Chapter 7

Shelf Management Alarm Module

7.1 Overview

This chapter describes the AdvancedTCA Shelf Management Alarm Module, hereafter known as the SAM, which consists of the Shelf Management Controller (ShMC) and the Shelf Management Mezzanine Module (ShMM) which installs on the carrier blade. Two SAMs are installed into two dedicated shelf manager slots located at the front right of the AXP640, 6 slot shelf. The SAM is hot swappable and the connectors are accessible through the face plate.

You will find the following information in this chapter:

- *Features*
- *SAM Diagram and Face Plate Layout*
- *Functional Description*
- *Hardware Monitoring and Control*
- *Telco Alarm Functionality*
- *Hot Swap Interface*
- *Power*
- *SAM Software*

The SAM supports redundant operation by automatic switchover between two SAMs. When two SAMs are present in a shelf, one acts as the Active SAM and the other acts as a Standby SAM. They share signals across the AdvancedTCA backplane that allow them to coordinate their redundant operations. The SAM provides access to the IPMCs for the Power Entry Module (PEM) and the two fan trays through the IPMB. The SAM also provides access to the AC PSUs from the upper slot via a private I2C interface.The SAMs use IPM Sentry Shelf Manager software for system management. Refer to *SAM Software* on page 184 for further information.

The SAM also provides these operations for the AXP640 shelf:

- Control for the activation/deactivation of AdvancedTCA blades
- Handles E-Keying
- Control of Power Management
- Monitoring of overall system and blade level health
- Logging for critical system events

- Support for the Command Line Interface (CLI) to access shelf information for:
  - Shelf blade population
  - List of sensors and sensor values
  - Sensor threshold settings
  - System events
  - Shelf health
- Control of chassis cooling management (fan levels)

7.2 Features

The SAM 640 is based on the Pigeon Point Systems ShMM-1500R and Freescale MPC8343 System On a Chip (SOC).

The following lists the features of the SAM.

- High density, small (92 mm x 50.8 mm) form-factor
- Fully compliant with the Restriction of Hazardous Substances (RoHS) directive
- I/O interfaces available on a Tyco 220-pin 0.5 mm Free Height receptacle
- 128 MB of DDR SDRAM with Error Correcting Code (ECC) support
- 266 MHz PowerPC superscalar RISC core with MMU and caches (32K/32K with parity)
- 64 MB of Flash
- Hardware support for a reliable upgrade of software images in Flash
- Dual IPMB with IPMB buffer controls for hot insertion and removal onto a live backplane
- Dual serial interface at RS232 or CMOS levels (one port with modem control)
- Dual 10/100Mbit Ethernet using the integrated 802.3 controllers buffered by external onboard

  PHY layer devices
- FPGA device on the PCI bus used to implement IPMB-0, the Shelf Manager-oriented

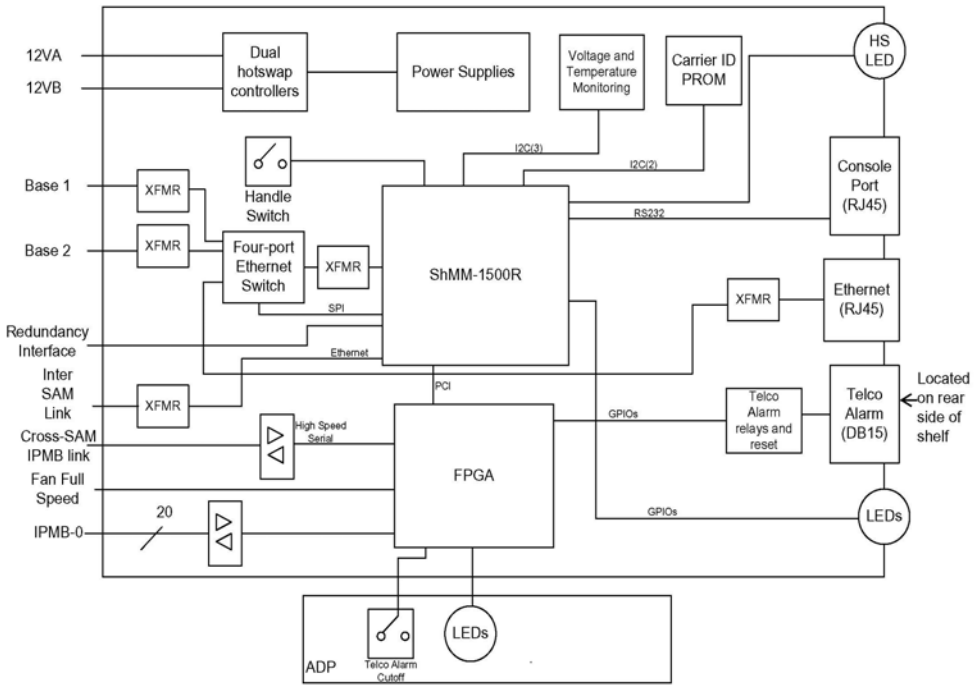
interfaces for hardware redundancy, hot swap and carrier ID, plus the ATCA Watchdog and a high-speed serial interface for an alternate software redundancy interface between peer ShMM-1500Rs.

- Three general-purpose I^2C interfaces (one with limitations) for access to on-carrier devices, such as hardware monitors and the Telco Alarm interface
- User SEEPROM
- External interrupt inputs
- User GPIO

7.3 SAM Diagram and Face Plate Layout

Figure 7-1 shows a block diagram of the overall SAM architecture and Figure 7-2 on page 169 shows the face plate layout.

Figure 7-1 Block Diagram of SAM



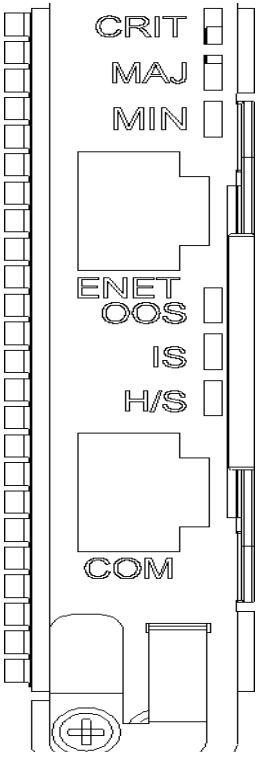
The SAM has these interfaces:

- Four 10/100Base-T Ethernet links
  - One link to each system controller and switching blade (2)
  - One link to the redundant SAM
  - One link to the face plate

- One Ethernet link, failover management status signals, and one IPMB branch or segment to the other SAM
- Radial IPMB links for up to 20 modules (16 blades, 2 fan trays, and 2 PEMs)
- Face plate interfaces that include 10/100Base-T Ethernet, and RS232 serial console, and Telco alarm status LEDs
- Interface to Telco Alarm connector located on the rear side of the shelf

The SAM provides the face plate LEDs listed in the following table. More detail on the LEDs is provided in the following sections.

Figure 7-2 SAM 640 Face Plate



7.4 Functional Description

The SAM has a high-density 220 pin socket for the shelf management mezzanine (ShMM) device and front-panel connectors for the serial console, Ethernet, and Telco alarm signals of the mezzanine. The dual-IPMB interface from the mezzanine is connected to the dual IPMBs in the backplane.

The SAM includes several on-board devices that enable different aspects of shelf management based on the shelf management mezzanine. These facilities include I^2C-based hardware monitoring/control and GPIO expander devices.

7.4.1 IPMB Connectivity

The IPMB is a dual radial topology. Each IPMC in the shelf connects to both SAMs for a redundant IPMB.

7.4.2 RS-232 Serial Interface

The SAM provides an RS-232 interface on the face plate connector using an RJ-45 connector. The connector is routed to the serial port of the shelf manager mezzanine.The default baud rate is 9600, 8, N, 1. Pin assignments for this connector are:

Table 7-1 RJ-45 Serial Port Connector

Pin	Signal	Direction
1	DSR	Input
2	DCD	Input
3	DTR	Output
4	GND	
5	RXD	Input
6	TXD	Output
7	CTS	Input
8	RTS	Output

7.4.3 Master-Only I^2C Bus

The SAM provides a number of I^2C devices using the master-only I^2C bus of the shelf manager mezzanine. The master-only I^2C bus is used internally on the mezzanine for the AC PSU and EEPROM devices. Additional I^2C devices connected to the bus on the SAM are used for the following functions:

- System hardware monitoring and control

7.4.4 Shelf FRU SEEPROM

The SAM provides access to the SEEPROMS on the backplane through the master-only I2C. Information stored in the SEEPROMS contains PICMG defined Shelf FRU data records that enable the SAM to self configure for the AXP640 shelf.

7.4.5 SAM LEDs

The SAM provides the LEDs listed in the following table. More detail on the LEDs is provided in the following sections. Also refer to Figure 7-2 on page 169 for SAM face plate LED locations and to Figure 2-1 on page 52 for the ADP teleco LED locations.

Table 7-2 SAM LEDs

LED	Type	Location
Telco	Critical alarm (CRIT) Major alarm (MAJ) Minor alarm (MIN)	SAM face plate
In Service	In Service (IS)	SAM face plate
Out of Service	Out of Service (OOS)	SAM face plate
Hot Swap	Hot swap ready (HS)	SAM face plate

7.4.5.1 Hot Swap LED

The SAM provides a blue hot swap LED. This LED indicates when it is safe to remove the SAM from a live shelf.

Table 7-3 Hot Swap LED States

State	Condition
Off	The SAM is not ready to be removed/disconnected from the shelf
Blue	The SAM is ready to be removed/disconnected from the shelf
Long-blink	The SAM is activating itself
Short-blink	Deactivation has been requested

The software running on the shelf manager mezzanine is responsible for turning the LED on/off using the GPIOs on the ShMC.

7.4.5.2 SAM Status LEDs

Status is shown using an LED on the SAM face plate. The illumination state of the LED is normally controlled by the GPIO on the SAM. The following tables describe the LED states.

Table 7-4 SAM LED Status Indicators

SAM Face Plate LED	LED Color	State	State/Condition
IS (In Service)	Green	On	Active, power good
		Blinking	Standby, power good
OOS (Out of Service)	Red	On	Failed
HS (How Swap)	Blue	On	Remove OK
Critical alarm (CRT)	Red	On	Active
Major alarm (MAJ)	Red	On	Active
Minor Alarm (MIN)	Yellow	On	Active

7.5 Management and Control

This section gives a general description of the role of the on-board I^2C devices and how management, control, and redundancy is handled by the SAM. Detailed information on sensors can be found in the *AXP1440/AXP1620 Subsystem IPMI Programmer's Reference*.

7.5.1 Hardware Monitoring and Control

The hardware monitoring and control functions implemented by the AXP640 are provided by the on-board I^2C-based devices.

7.5.1.1 Voltage Sensors

On-board sensors provide the following power supply voltages. All voltage sensors are implemented using the ADM1024 device on the master-only I^2C bus. System management software running on the SAM is responsible for reacting to an event when an interrupt is triggered by the ADM1024 device.

7.5.1.2 Temperature Monitoring

There are two temperature sensors on the SAM. One for monitoring critical on-board temperature and on for monitoring inlet air temperature.

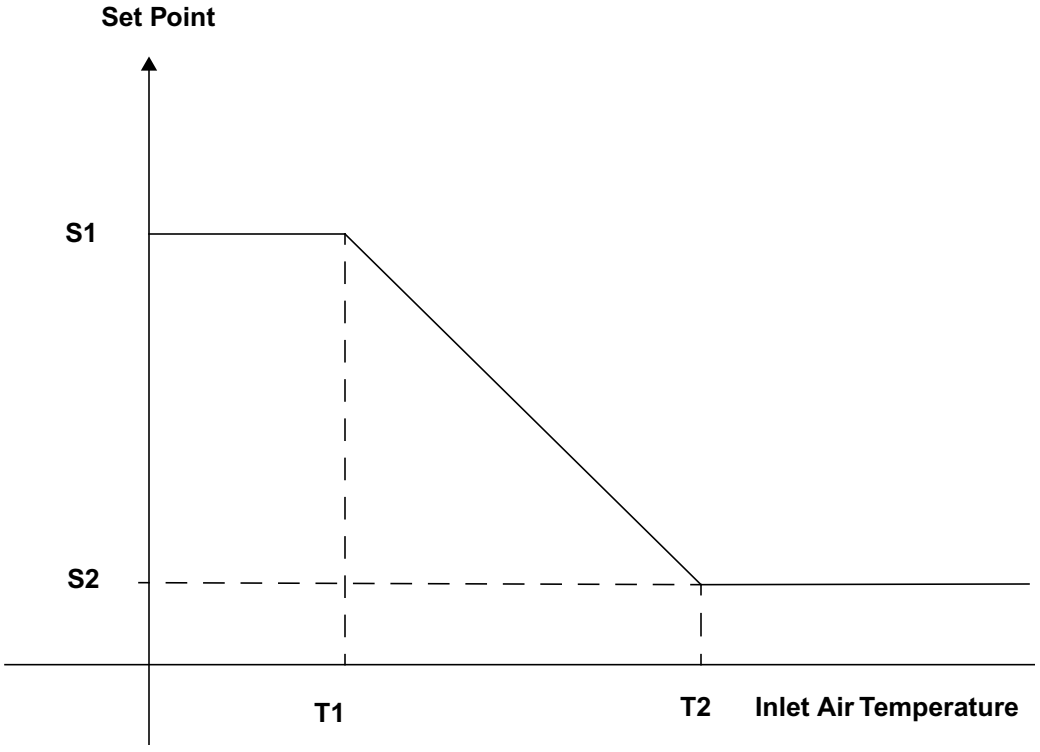
7.5.1.3 Fan Speed and Control

All fan speed and fan voltage sensors are exposed on the active SAM.

The FTMs have 100 fan speed settings. The SAM uses a proprietary cooling algorithm to automatically adjust the fan speed to cool the chassis based on sensor data from the blades as well as inlet and outlet sensors on the FTMs. The minimum fan speed is 15.

In normal operating conditions, the cooling algorithm adjusts the fan speed based on the ambient air temperature as measured at the inlet fans to maintain a deltaT value (calculated to be the rise in air temperature measured at the inlet and outlet sensors) based on the inlet air temperature value. The lower the ambient temperature, the higher the rise in temperature allowed.

The deltaT set point is calculated as follows:



For ambient air temperatures at or below 25°C (default T1), the deltaT set point is set to 20°C (default S1). For ambient air temperatures at or above 55°C (default T2), the deltaT set point is set to 10°C (default S2). For ambient air temperatures between T1 and T2, the deltaT set point is calculated using the following algorithm:

$$S1 + \frac{S2 - S1}{T2 - T1} (T_{inlet} - T1)$$

Using the above algorithm, at 40°C ambient, the cooling algorithm adjusts the fan speeds to maintain a deltaT rise in temperature at 15°C.

Table 7-5 Cooling Budget

Ambient Temperature	Temperature Rise
25°C	Delta T = 20° C
40°C	Delta T = 15° C
55°C	Delta T = 10° C

The values for S1, S2, T1, and T2 are configurable.

In abnormal operating conditions; that is, when a blade thermal sensor is approaching or crossed its upper non-critical threshold, the SAM automatically adjusts the fan speeds to a point where all the blade thermal sensors are just below their upper non-critical threshold (minus a user configurable offset).

The dynamic minimum fan level is not used.

There are three fan trays, each containing a single fan. Fan RPMs vary between 1000 and 11000 based on the commanded fan level (0 to 100).

7.5.2 Redundancy Control

The ShMM-1500R supports redundant operation with automatic switchover using a redundant ShMM-1500R. In a configuration where two ShMM-1500Rs are present, one acts as the active shelf manager and the other as a standby. Both ShMM-1500Rs monitor each other, and either can trigger a switchover if necessary.

7.5.2.1 Hardware Redundancy Interface

The hardware redundancy signals of the ShMM-1500R are implemented as follows:

- Cross connected ShMM-1500R present input (PRES_R#) and output (PRES_L#)
- Cross connected ShMM-1500R status 0 input (SHMM_STATUS0_R) and output (SHMM_STATUS0_L)

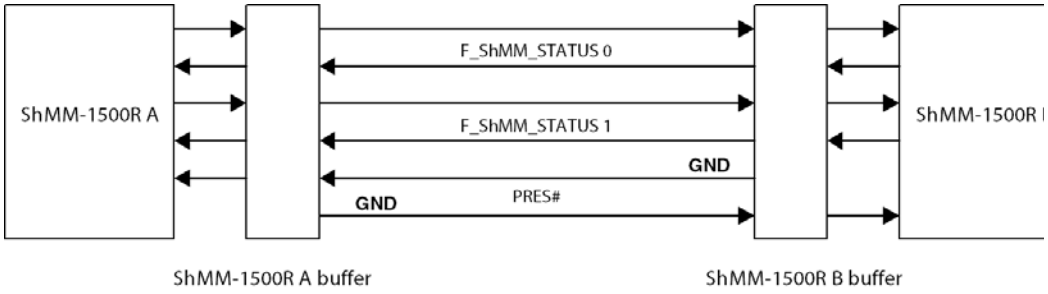
- Cross connected redundant ShMM-1500R status 1 input (SHMM_STATUS1_R) and output (SHMM_STATUS1_L)
- Active output (ACTIVE#) that can be used on the ShMM-1500R carrier to enable interfaces that must be exclusively driven by the active ShMM-1500R
- Bi-color status LED

The cross-connected ShMM-1500R status signals are asynchronous serial bit streams that are transmitted to the peer-ShMM by the FPGA and communicate the following information: Health status, Switchover Requests, PRES_R state, Active state, watchdog timer status, parity and other data. An identical copy of the bit stream is also sent on the redundant ShMM-1500R status signal. This information is used to ensure that only one of the two connected ShMM-1500Rs goes into active mode at a time. Figure 7-3 on page 177 shows the HRI of the ShMM-1500R.

As shown in the figure, the ShMM-1500R HRI incorporates a hot-swap buffer (IDT QuickSwitch), which isolates the interface from the peer ShMM prior to FPGA configuration or when the ShMM-1500R is powered down. The QuickSwitch device is guaranteed to be disabled (open) when unpowered and does not have a low impedance path from any of the signal pins to the power or ground rails. Hence, the device prevents an unpowered ShMM-1500R from loading down the HRI of the peer ShMM-1500R. It also prevents a carrier from detecting the ACTIVE# output as a zero; that is, active, during a ShMM-1500R power cycle or a ShMM-1500R power supply failure.

The FPGA device contains a built-in CRC error checker for detecting soft errors in the configuration data. When a CRC error is detected the signal LATCH_CRC_ERROR is set active by the ShMM-1500R CRC error detection circuit, which immediately sets the ShMM_STATUS[0:1]_L and ACTIVE# signals high. The peer ShMM-1500R, if it is not already active upon detecting the loss of the status serial bit streams, becomes the active ShMM-1500R.

Figure 7-3 SAM HRI Interconnection



The HRI also includes 13 test points for in-service monitoring of the hardware redundancy signals and for out-of-service diagnostics, enabling the ShMM-1500R to isolate failures on the HRI to a single carrier +ShMM-1500R pair.

7.5.2.2 HRI Protocol

In the redundant configuration, the two ShMM-1500R boards communicate through the HRI by exchanging data packets. The HRI continues to be operational in case of a single interconnection failure and is able to detect a double failure. The HRI has a redundant communication path, using four signals. In the case of a single wire permanent failure (the signal gets stuck high, low or breaks), data packets continue to be transmitted through the redundant communication path. A short between two of these four signals is considered a double failure.

7.5.2.3 Ethernet Signals

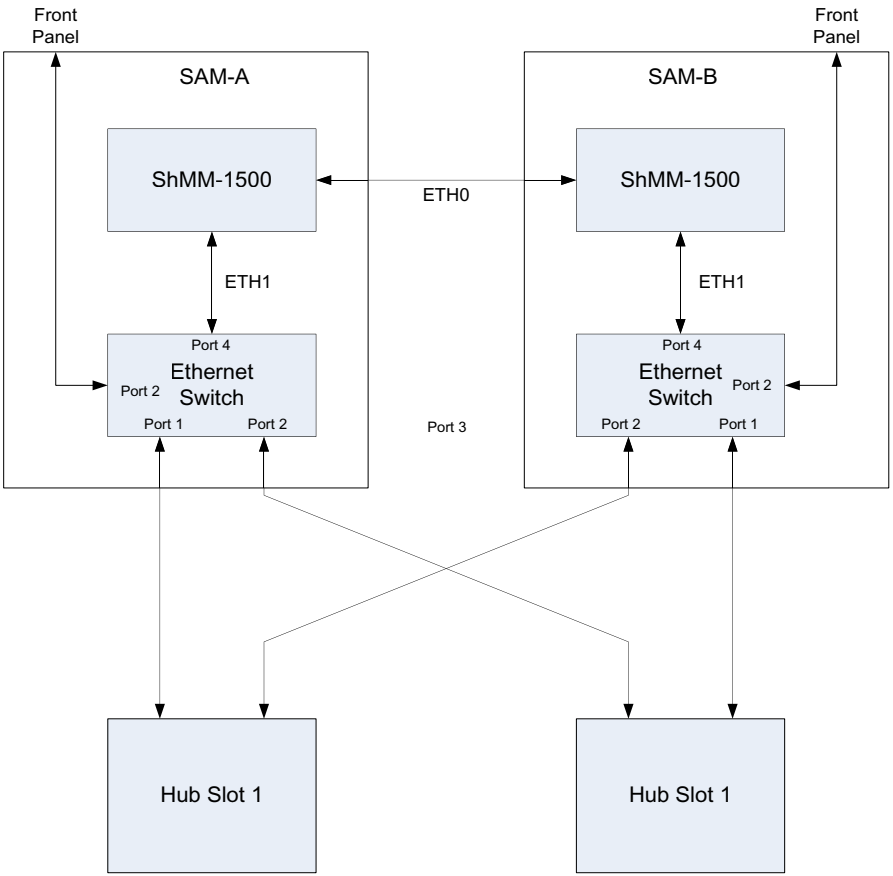
The ShMM1500R provides two 100BaseT Ethernet ports, identified within the Linux environment as eth0 and eth1.The eth0 port is cross-connected to the eth0 port on the other SAM to provide a dedicated high-speed inter-SAM link for the exchange of status and configuration details. The eth1 port is connected to an Ethernet switch (a Broadcom BCM5325E), which in turn connects to the base ports of the two hub slots and to the front-panel RJ45 Ethernet connector.

The port utilization of the switch is:

- TP port 1 to Local hub slot
- TP port 2 to Remote hub slot
- TP port 3 to Front panel RJ45)
- TP port 4 to ShMM1500R
- TP port 5 is not used
- MII port is not used

The default state of the Ethernet switch is not to forward packets between ports. The correct switch configuration for normal operation is to allow ingress from ports 1, 2 and 3 to port 4 and to allow egress from port 4 to ports 1, 2 and 3. With the exception of routing a port to itself, all other routes are blocked.

Figure 7-4 Interhub Slot and Shelf Manager Connectivity



The default configuration of Ethernet channels is depicted inTable 7-6 and Table 7-7.

Table 7-6 Shelf Manager Static Network IP Interfaces

Function	IP Active SAM	IP Backup SAM	Ethernet Device	Default State
SAM - SAM	192.168.25.101	192.168.25.100	ETH0	Enabled
Front Panel RJ-45	0.0.0.0	0.0.0.0	ETH1	Disabled
SAM to Hub	192.168.24.101	192.168.24.100	ETH1.24	Enabled

Table 7-7 Shelf Manager Dynamic Network IP Interfaces

Function	IP Active SAM	IP Backup SAM	Ethernet Device	Default State
RMCP	192.168.24.11	192.168.24.10	ETH1.24:1	Enabled

NOTICE

The IP addresses defined in Table 7-7 are relative to active/standby SAM. When active/standby switchover takes place the addresses are re-assigned to the appropriate physical SAMs. Addresses ending in '1' are always associated with the active SAM. Addresses ending in '0' are always associated with the standby.

7.5.2.4 Configuring Front Panel Network Interface

To set front panel Ethernet and make it permanent over power cycle set the following U-boot environment variables. This may be done in Linux or U-Boot. If done in U-Boot `saveenv` must be executed to save the environment variables.

```
setenv ip1addr <IP address>

setenv gatewayip <gateway IP>

setenv enable_front_panel_ethernet y

saveenv
```

7.5.2.5 Configuring RMCP Network Interface

To change the RCMP network address that is associated with the Active and Standby Shelf managers from the default values, use the following `clia` command on the Active Shelf Manager, where `xxx.xxx.xxx.xxx` indicates a sample IP address.

```
clia setlanconfig 1 3 xxx.xxx.xxx.xxx
```

This will set the floating RCMP IP address associated with the Active Shelf Manager specified by the IP address supplied in the command. The Standby Shelf Manager floating RCMP address will be the exclusive-OR of the least significant bit of that address. If the IP address assigned with the `setlanconfig` is odd, the Standby Shelf Manager floating RCMP IP address will be 1 less than the active. If the RCMP IP address for the Active Shelf Manager is even, then the RCMP IP address for the Standby Shelf Manager will be greater by 1. For information on configuration of additional characteristics of the RMCP interface, like subnet address and so on, refer to *Pigeon Point Shelf Manager External Interface Reference*.

7.5.3 Switchover Signals

A switchover takes place when the Standby SAM determines that the Active SAM is no longer operational. The signs of this are:

- The REMOTE_HEALTHY or REMOTE_PRESENT changes to FALSE. This indicates that the peer SAM is no longer healthy or present
- The TCP connection between the Active and the Standby SAMS closes. The keep alive time-out parameter for this connection is set to 1 second to recognize a malfunction of the Active SAM as quickly as possible. In this case the Standby SAM waits for 3 seconds and then checks the state of the REMOTE_HEALTHY to make sure the connection is broken due to a failure of the Active SAM and not due to a communication failure.
  If the Standby SAM detects that the Active SAM is still healthy it doesn't perform the switchover but instead reboots itself. After the reboot it makes a second attempt to initialize as a backup and will continue until either it succeeds in establishing the connection with the Active SAM or it detects that the Active SAM is no longer healthy. If it detects that it isn't healthy it will initialize as the Active SAM.

- When the Active SAM receives a switchover command from the Standby SAM and agrees to switchover, it closes the TCP connection, clears the LOCAL_HEALTHY bit and exits the program which indicates the switchover to the Standby SAM.
  If the Standby SAM decides that a switchover should take place it closes the TCP connection and exits this function. Activate callbacks are called for all facilities and the SAM starts to work in active mode, with no backup. At this moment the SAM sets the LOCAL_SWITCHOVER bit, requesting the hardware to recognize it as the Active SAM. In response, the hardware must set the ACTIVE bit. When the formerly active SAM restarts it successfully establishes the connection with the current SAM and starts to operate in the backup mode.

7.6 Telco Alarm Functionality

The AXP640 provides Telco alarm functionality with the following components:

- DB15 Telco alarm contacts located on the rear of the chassis
- Telco alarm LEDs located on the SAM faceplate

7.6.1 Telco Alarm LEDs

These LEDs are used to indicate the presence of the critical, major, and minor alarms. When a LED is lit, the respective alarm is active. A blinking LED signals an alarm cut-off state.

7.6.2 Telco Alarm Interface

The alarm connection, which is a standard DB-15 connector located on the upper right side of the rear of the AXP640 shelf. The DB-15 connector has the following pin assignments:

Table 7-8 Hot Swap Interface Pin Out

Pin	Description
1	Minor Alarm Reset +
2	Minor Alarm Reset -
3	Major Alarm Reset +
4	Major Alarm Reset -

Table 7-8 Hot Swap Interface Pin Out (continued)

Pin	Description
5	Critical Alarm - NO
6	Critical Alarm - NC
7	Critical Alarm - COM
8	Minor Alarm - NO
9	Minor Alarm - NC
10	Minor Alarm - COM
11	Major Alarm - NO
12	Major Alarm - NC
13	Major Alarm - COM
14	Pwr Alarm - NO
15	Pwr Alarm - COM

7.7 Hot Swap Interface

The SAM provides a hot swap interface allowing the SAM to be replaced without powering down the shelf. The hot swap interface is implemented using the shelf manager mezzanine CPLD device. The interface is composed of three components:

- Screw activated faceplate switch
- Presence signal indicating that the SAM is fully seated in its backplane connector
- HS LED to indicate safe to remove state

7.8 Power

The SAM uses dual 48V power feeds, one from each PEM. Hot swap circuitry ensures correct operation when a SAM is inserted into or removed from a live system.

7.9 SAM Software

The software that runs on the shelf manager is described in detail in the *Pigeon Point Systems IPM Sentry Shelf Manager User Guide*, which provides an introduction to shelf management, the shelf manager, and the shelf management mezzanine. Also available is the *Pigeon Point Systems IPM Sentry Shelf-External Interface Reference* which describes the command line, web, SNMP (Simple Network Management Protocol), and RMCP (Remote Management Control Protocol) interfaces. Refer to Appendix A, *Related Documentation* for more information on these publications.

7.9.1 imls Utility

A utility called imls is available on the SAM. It can be used to list all firmware images present in flash. Note that the Shelf Manager flash is divided into two banks. Each bank contains a set of three separate firmware images:

- U-Boot
- RFS
- Kernel images

When the rupgrade_tool utility is used to perform a reliable firmware upgrade operation on the Shelf Manager, the flash bank that is currently not active is programmed with the new images, the processor is reset, and the newly programmed flash bank is selected.

If the new firmware fails to load or execute properly, the Shelf Manager automatically resets and reverts to the previous flash bank. Selection of the bank to be used for booting is not a configurable option at run-time.

The following text shows sample output obtained by running imls at the Shelf Manager Linux prompt. Note that the first three images listed reflect the currently active flash bank contents, and the next set of three images is contained within the other flash bank.

```
# imls
/dev/mtdblock3:
Image Name:   U-Boot 1.1.4 for shmm1500 board
Created:      Fri Jun  6 14:51:44 2008
Image Type:   PowerPC Linux Firmware (uncompressed)
Data Size:    212992 Bytes = 208.00 kB = 0.20 MB
Load Address: 0xF0000000
Entry Point:  0x00000000
```

```
/dev/mtdblock2:
Image Name:   Linux-2.4.25
Created:      Fri Jun  6 14:59:00 2008
Image Type:   PowerPC Linux Kernel Image (gzip compressed)
Data Size:    793193 Bytes = 774.60 kB = 0.76 MB
Load Address: 0x00000000
Entry Point:  0x00000000

/dev/mtdblock4:
Image Name:   shelfman 4.0.0 build 21
Created:      Fri Jun  6 15:07:27 2008
Image Type:   PowerPC Linux RAMDisk Image (gzip compressed)
Data Size:    5398657 Bytes = 5272.13 kB = 5.15 MB
Load Address: 0x00000000
Entry Point:  0x00000000

/dev/mtdblock8:
Image Name:   U-Boot 1.1.4 for shmm1500 board
Created:      Thu Mar 27 21:27:47 2008
Image Type:   PowerPC Linux Firmware (uncompressed)
Data Size:    212992 Bytes = 208.00 kB = 0.20 MB
Load Address: 0xF0000000
Entry Point:  0x00000000

/dev/mtdblock7:
Image Name:   Linux-2.4.25
Created:      Thu Mar 27 21:33:51 2008
Image Type:   PowerPC Linux Kernel Image (gzip compressed)
Data Size:    793096 Bytes = 774.51 kB = 0.76 MB
Load Address: 0x00000000
Entry Point:  0x00000000

/dev/mtdblock9:
Image Name:   sentry.shmm1500 RFS Ramdisk Imag
Created:      Thu Mar 27 21:41:21 2008
Image Type:   PowerPC Linux RAMDisk Image (gzip compressed)
Data Size:    5429028 Bytes = 5301.79 kB = 5.18 MB
Load Address: 0x00000000
Entry Point:  0x00000000
#
```

From the sample output, it is possible to see the compilation dates of the U-Boot, RFS, and Kernel images for both the active and non-active firmware banks. Compilation times will never be identical for all three images, but should be relatively close to each other.

Related Documentation

A.1 Artesyn Embedded Technologies - Embedded Computing Documentation

The publications listed below are referenced in this manual. You can obtain electronic copies of Artesyn Embedded Technologies - Embedded Computing publications by contacting your local Artesyn sales office. For released products, you can also visit our Web site for the latest copies of our product documentation.

1. Go to www.artesyn.com/computing.
2. Under SUPPORT, click TECHNICAL DOCUMENTATION.
3. Under FILTER OPTIONS, click the Document types drop-down list box to select the type of document you are looking for.
4. In the Search text box, type the product name and click GO.

Table A-1 Artesyn Embedded Technologies - Embedded Computing Publications

Document Title	Publication Number
ATCA-F125 Installation and Use	6806800J94
AXP 640 Control via IPMI Programmer's Reference	6806800N06
System Management Interface Based on HPI-B (AXP1620/1440) User's Guide	6806800D85

A.2 Related Specifications

For additional information, refer to the following table for related specifications. As an additional help, a source for the listed document is provided. Please note that, while these sources have been verified, the information is subject to change without notice.

Table A-2 Related Specifications

Document Title and Source	Publication Number
Pigeon Point Shelf Manager User Guide	
Pigeon Point Shelf Manager External Interface Reference	

Table A-2 Related Specifications (continued)

Document Title and Source	Publication Number
IEEE http://standards.ieee.org/catalog/	
IEEE Standard for Local Area Networks: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Institute of Electrical and Electronics Engineers, Inc.	IEEE 802.3 March 2002
IEEE Amendment 1: Media Access Control parameters, Physical Layers, and Management Parameters for 10Gb/s Operation	IEEE 802.3ae August 2002
PCI Industrial Manufacturers Group (PICMG) http://www.picmg.com/	
PICMG 3.0 AdvancedTCA Base Specification, Revision 1.0	PICMG 3.0 R 1.0 December 30, 2002
PICMG 3.0 AdvancedTCA Serial Interconnect Specification R2.0	PICMG 3.0, R2.0
PICMG 3.1 AdvancedTCA Ethernet/Fibre Channel, Revision 1.0	PICMG 3.1 R1.0 January 22, 2003
PICMG 3.0 ECN 3.0-1.0-001	January 21, 2004 ECN 3.0, 1.0-001

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